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The use of self instruction problem solving to enhance generalisation in mildly intellectually disabled schoolchildren

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THE USE OF SELF INSTRUCTION PROBLEM SOLVING TO ENHANCE GENERALISATION IN MILDLY INTELLECTUALLY DISABLED SCHOOLCHILDREN.

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ABSTRACT

Self Instruction Problem Solving (SIPS) has evolved from a decade of research and development of cognitive and metacognitive theory, most notably from the Verbal Self Instruction Technique (VSIT). SIPS offers a structured approach to training in which the individuals' cognitive style is allowed to develop, free from the imposition of strong modelling from the instructor. If education is to be, in reality, preparation for life, then problem solving must be applicable to the everyday environments of largely uncertain goals and loosely defined structures. Investigation of SIPS with adult intellectually disabled, has suggested that SIPS results in a greater generalisation of skills but as yet there is a dearth of research into the area of mildly intellectually disabled schoolchildren. A pilot study, which included mildly intellectually disabled schoolchildren, suggests that SIPS will offer greater generalisation of skills, and therefore is worthy of thorough investigation in this field. The purpose of this study is to extend the current knowledge of SIPS to include research for the utility of SIPS with mildly intellectually disabled schoolchildren.

CHAPTER 1

INTRODUCTION

1.0. Background of the Problem

There is ample evidence to suggest that intellectually disabled people do not use active strategies for learning or solving problems (Brown, 1974; Butterfield, 1987; Butterfield & Ferretti, 1985; Butterfield & Gow, 1987; Ferretti & Belmont, 1983; Gow, 1987; Gow, Burton & King, 1988; Gow, Ward & Balla, 1985; Havertape & Kass, 1977; Maker, 1981; Padawer Zupan & Kendall, 1980; Ward and Gow, 1982). From the literature it can be concluded that students with intellectual disabilities: lack learning strategies, lack independence/self-learning skills, tend to be passive learners, have less verbal control of non-verbal behaviour than their non-disabled peers, do not attend to the relevant aspects of stimuli (Gow, 1987; Gow, Burton & King, 1988), fail in generalisation because there has been too little attention to the processes that underlie transfer and because there are too few distinctions drawn among the kinds of transfer (Butterfield, 1987), produce performance which is usually situation specific and therefore episodic in nature (Gow, 1986; Gow, Burton & King, 1988), and possess low levels of verbal control of non-verbal behaviour (Gow, Burton & King, 1988).

In attempting to explain the passive, rather than active, participation of intellectually disabled people in the learning process Butterfield (1987), Butterfield & Ferretti (1985), Butterfield & Gow (1987), Ferretti & Belmont (1983), Gow (1987), Maker (1981) and, Ward and Gow (1982) have argued that it could be related to an inability to generalize a previously learned problem-solving strategy to a new problem. Unfortunately, this problem area of generalisation of training has been seriously neglected (Ward & Gow, 1982), notwithstanding the widely-held belief that generalisation is arguably the most important unsolved problem of education and psychology (Gow & Butterfield, in press). This neglect was identified by Stokes & Baer (1977) who noted that most studies claiming to have achieved generalisation operated on a "train and hope" basis whereby generalisation was expected to happen without programming.

Findings from research (see Gow, 1987) with adult retarded populations have shown that Self-Instruction Problem Solving (SIPS) facilitates generalisation of skills from one domain to another, a technique in which the intellectually disabled are not proficient (Havertape & Kass, 1977). If these findings are applicable to the mildly intellectually disabled (O.A.) student, in that it is possible to teach for generalisation of skills from one situation to another, then the implications to the O.A. curriculum (both within special schools/classes or within the mainstream) are profound. Furthermore, the SIPS model appears to be very convenient for teachers, not least because of its ease of programming and non-dependence on reinforcement (Gow, 1987), factors that continually undermine the application of the once preferred Applied Behaviour Analysis (ABA) technique (see Chapter 2 Part C).

1.1. Statement of the Problem

Findings of significant research indicate the promise of cognitive theory in facilitating the generalisation of skills (Belmont, Butterfield & Ferretti, 1982; Gow, Ward & Balla, 1985; Sternberg, 1982). Despite the evolution (perhaps revolution) of this "new wave" of cognitive and metacognitive theory (see Chapter 2 Part D), the rationale and theories of the metacognitively based Self Instruction Problem Solving (SIPS) model remain untested with respect to the school aged student. In particular, the SIPS model has not been investigated with respect to the school aged mildly intellectually disabled (O.A.) student.

This dearth of research with the school aged mildly intellectually disabled population could well be retarding the learning potential of this significant group of intellectually disabled.

1.2. Purpose of the Study

This study will examine the application and effectiveness of the SIPS model within the regular classroom program of primary and secondary O.A. students. Measures will be taken in pre-tests and post-tests to discover whether the SIPS program enhances generalisation of problem solving skills across curriculum domains.

1.3. Need for the Study

The O.A. student group represents a significant number of children within our schools, possibly more than 2.5%. The Doherty Report (1982) found 1% of the total school population were in the category of mildly intellectually handicapped (i.e. mildly intellectually disabled) and catered for in special schools or classes, while a further 1.54% of the total school population were in the category of mildly intellectually handicapped and catered for in regular classes.

Therefore lack of research could well be proving deleterious to at least 2.5% of the student population.

1.4. Questions to be Examined

This study will seek to determine whether the teaching of the SIPS technique to primary-aged and highschool-aged students through the regular teacher's program for the O.A. class will facilitate generalisation.

In particular, this study asks if the generalisation of problem solving skills can be seen as measured improvement in the domains of reading comprehension, reading rate, reading accuracy, aural comprehension and practical mathematics. Furthermore, the results of the primary-aged students and the secondary-aged students will be examined for differences.

1.5. Conceptual Assumption

The subjects in this study have been classified, by the Department of Education, as mildly intellectually disabled (O.A.) students (see Chapter 2 Part A). This classification has led to their placement in a Special Education class, either Primary or Secondary, depending on the age of the student.

Therefore at the conception of this study it is assumed that six weeks is too short a time to attribute any particular improvement in performance to developmental progress. However, the use of a control group takes this possibility into account should this not be the case.

1.6. Substantive Assumption

The O.A. students in this study will continue to be taught by their regular teacher(s) and within their regular classroom(s).

Therefore as the only change in the students' regular routine will be the implementation of the SIPS program, this study will assume that any significant improvement exhibited by the students over a six week period must be due to the implementation of the SIPS program.

1.7. Theoretical Framework

The theoretical framework for this study is provided by cognitive theories of instruction. This study realizes the metacognitive domain as the component that seems most useful in explaining generalisation failures (Borkowski, 1985).

Belmont, Butterfield & Ferretti, (1982) refer to two classes of cognitive activity constituting an individual's problem solving technique which they termed meta-knowledge and meta-processing. Meta-knowledge is defined as an awareness of domain specific knowledge. Meta-processing is defined as a superordinate function by which basic information processing mechanisms are organised to solve problems; that is, the repertoire of content free strategies or procedural knowledge such as planning, self-interrogation skills, self-directing and self checking.

Borkowski and Kurtz (1984) add to this background of meta-knowledge and meta-processing the concept of metamemory. Metamemory is defined as a more efficient cognitive strategy which involves a specific form of metacognition; that being an individual's personal knowledge regarding factors influencing memory activities.

Failures in meta-processing and metamemory are of the greatest concern to the school teacher, as deficiencies lead to adaptive failure in many ways; most notably, failure to generalize recently learned skills to situations other than the one in which initial learning was accomplished.

SIPS is a technique by means of which the learner manages his/her own thinking, thereby using cognitive strategies to control individual behaviour (Gow, 1987).

1.8. Variables

The variables for this research are as follows:

1.8.1. Dependent Variable

The difference in the scores obtained by the students in their post-test and pre-test for each of the following: SIPS rating, reading comprehension, reading rate, reading accuracy, aural comprehension, and, practical mathematics.

1.8.2. Independent Variable

The implementation of the Teacher's Program for Self Instruction Problem Solving.

1.9. Delimitations

Subjects for this research will include four groups of mildly intellectually disabled students from the South Coast Region. These groups have been selected from two primary O.A. classes and two high school O.A. classes (see 3.8. Selection of Subjects).

1.10. Limitations

This study recognizes the limitation of a small sample. However, O.A. classes themselves are not common. Indeed, the clientele for an O.A. class is comprised of students from feeder schools as O.A. facilities are not available in every school. Therefore, it was decided to limit this research to four classes and, in doing so, to accept the attendant risks which are considered reasonable.

1.11. Definition of Terms

The following definitions have been adopted in this thesis:

1.11.1. O.A. (Opportunity A) Student

An O.A. student requires special support because the nature of his/her difficulty demands strategies which cannot be provided readily by the regular classroom or subject teacher (Swan, 1976).

An O.A. student is intellectually handicapped with specific learning disabilities and functions within the I.Q. range 55-80 (The Shoalhaven Special Education Service, 1986).

1.11.2. Regular class teacher

The teacher who under normal circumstances is responsible for the classroom program.

1.11.3. Teacher's Program for Self Instruction Problem Solving

The program as set out in the package of program and tests to enable this research to be carried out (see Appendix 2).

1.11.4. SIPS

Self Instruction Problem Solving Technique as developed by Gow (see Chapter 2 Part G).

1.11.5. A cognitive strategy

An internally organised skill that enables the selection and guidance of the internal processes involved in defining and solving problems. It is a skill by means of which the learner manages his/her own thinking behaviour which in turn affects overt or observable behaviour (Gow, 1987).

1.12. Organisation of this Thesis

This thesis is set out in the basic five chapter format of a quantitative research report. The addition of a second volume has been realized to cater for the list of references and appendices.

As noted in section 2.E.1., the literature with respect to any cognitive study reflects origin-specific spellings. My decision was to use a "z" in the verb (verbalize, generalize) and an "s" in the noun (verbalisation, generalisation). I have used the accepted English spellings for "behaviour" and "counsellor", however, I have adopted the commonly accepted "program". If during any direct quote, the quoted author has used an origin-specific spelling, I have not inserted "(sic)" to explain this occurrence, but rather I have accepted that spelling.

Within the text of this thesis, I have followed the Modern Language Association (1977) system of parenthetical notation stating the name and year of each reference.

CHAPTER 2

The Search of the Literature.

PART A. The Opportunity A (O.A.) Child: Background to This Group of Intellectually Disabled School Pupils.

2.A.0. Overview.

Research by Havertape and Kass (1977) concluded that in many cases, intellectually disabled students have few attack strategies to apply to problem solving. Moreover, they deduced that those who possess some strategies often do not use them effectively. There is consensus in the literature, as summarised in Section 1.0., that students with intellectual disabilities lack the strategies that facilitate effective learning.

This section of this chapter attempts to define the O.A. student of N.S.W. through Department of Education literature. Where necessary, these terms will be elaborated upon from other sources of current literature in the interest of clarity. It should be noted that there is currently a move towards changes to Departmental O.A. criteria (now termed I.M.). The Minister for Education has recently released "A Plan for Special Education in N.S.W. Schools", along with "Special Education Plan: Key Points" and "Liberal-National Party Policy Education: The Facts" (Metherell, 1988(a),(b), (c)). This plan offers a committment to integration and normalisation through the existing cascade of services (see Doherty, 1985: Swan, 1976) by stating in Principle 5:

> Placement should be in the least restrictive environment, in age appropriate settings, and within available resources. The "least restrictive environment" is the term used to indicate the educational placement of disabled pupils should be made with the aim of maximising peer group interaction without jeopardising the child's access to the special resources which are essential for reaching full potential (Metherell, 1988a).

However, to date the new plan has not drafted definitions and classifications of disabled students other than to reiterate the Swan (1976) cascade and Doherty's (1982) confirmation of "the desirability of the five levels of service" (Metherell, 1988a:4). The students participating in this study have been selected for their placement under the existing 1987 Departmental criteria and definition for O.A. students, as set out below. Therefore, in the interest of precision, this study will use the terms "O.A. student" and "O.A. placement" rather than the new terminology.

2.A.1. Background to Departmental Services.

In 1976 the then Director General issued a statement on remediation which referred to students with learning difficulties, stating:

> Pupils at every level need help to overcome difficulties of learning. Some need only direct assistance to attain appropriate personal standards. Others require attention to basic, causal factors, such as language difficulty underlying a reading problem, or the emotional or

> social concomitants of their learning problem. In many instances, information from the home and from supportive guidance, medical allied health and other services needs to be evaluated for the development of appropriate teaching strategies and educational programs.
>
> Where the nature of the child's difficulties demands strategies which cannot be provided readily by the classroom or subject teacher, special support is necessary (Swan, 1976).

The majority of students with "learning difficulties" were considered catered for best through the Director General's Resource Teachers Memorandum to Principals (Swan, 1976a). This document referred to students whose difficulties were such that the teacher needed specialized advisory services to maintain the student's development in the regular class, as well as to students whose difficulties were such that the regular school staff needed assistance from an additional specially trained teacher. This memorandum stated that the **Resource Teacher** was to provide the supportive service to the school as a whole, integrated with the learning programs of the regular classroom.

In 1987 a Departmental Policy Statement **The Education of Students with Learning Difficulties from Pre-School to Year Twelve** states:

> It is the policy of the N.S.W. Government and the Department of Education to provide maximum opportunity to all students to aquire the skills and competencies necessary to participate in and contribute to society. It is important that students who have difficulties with learning are not disadvantaged...(Winder, 1987:Foreward).

However, with the exception of changing the name of the Resource Teacher to Support Teacher (Learning Difficulties) (Departmental Policy Statement, 1987), there is very little difference in the latter Policy and the earlier Swan statements (1976, 1976a).

The Support Teacher offers assistance to the regular teacher "predominantly in a team teaching role within classrooms on the implementation of programs" (N.S.W. Department Education Policy Statement, 1987:5). It is of some interest that while the departmentally preferred mode is that of team-teaching, also exemplified by the Hunter Region Policy and Guidelines for Primary and Secondary Teachers (Beard, 1985) and North Sydney Region Resource Teacher's Guideline Statement (Reid, 1982), research has suggested that the regular teacher prefers the withdrawal mode (see Hall & Gow, 1986). However, the Policy does state:

> The Support Teacher position must not be used to establish a separate class (N.S.W. Department Education Policy Statement, 1987:6).

The 1987 Policy Statement does not refer to those students whose difficulties are such that they are deemed to require special class placement.

Effectively the Department of Education offers a variety of modes to cater for students with "learning difficulties", with each student receiving the support thought best suited to his/her needs. For students whose difficulties are such that they are unable to be catered for in the regular classroom, N.S.W. offers a "Cascade of Services", that is, movement along an educational continuum, which may include:

> placement in special schools of severely handicapped children previously receiving little or no educational service....
> movement from institution to community special school.....
> the transfer of moderately handicapped children from special classes to regular schools......
> complete or partial mainstreaming of children with handicapping conditions into regular classes in regular schools (Doherty, 1985:6).

Services to a student deemed O.A. are considered best met by special placement into an O.A. Unit or class in a regular school, which has smaller numbers than a regular class and a full-time specially trained teacher.

2.A.2. The Criteria for Categorisation as O.A..

An O.A. student is one who is intellectually handicapped with specific learning difficulties and who functions in the I.Q. range 55-80 on an individual test of general ability (Hardes, 1986; Mulholland, 1981). Those students who fall just outside this range may also be considered for placement in an O.A. class, following approval of the Regional Director (Mulholland, 1981). An O.A. primary school student may be enrolled in an O.A. primary class from 8-12+ years, and continue into an O.A. secondary class till 18+ years (Hardes, 1986).

The Department takes great care to ensure that students selected for an O.A. placement are indeed properly placed, and only for the formally recognized reasons:

> Children regarded as suitable for Opportunity "A" placement should be referred by the Principal on the appropriate forms......through the school counsellor for consideration.
>
> In compiling a list of possible eligible pupils, the Principal should ensure that nomination is based on sound criteria. It should be stressed that a child's name should be listed <u>only after the closest observation of him/her in a variety of educational situations and not from any interest in "having the child tested"</u>. Particular care should be exercised in the nomination of migrant pupils (Mulholland, 1981:1, quoting from a regional circulation).

2.A.3. The Needs of the O.A. Student.

The N.S.W. Department of Education, in one of its numerous O.A. curricula support documents, stresses the special needs of the O.A. student:

> ...evidence has shown that retarded individuals display deficits of varying degrees across all components of the social competence domain. By adolescence and adulthood, most problems among the mildly retarded have been reported as occurring in communications, the formation and maintenance of relationships, social awareness, and the production of socially acceptable behaviour.
>
> ...Research has also shown that mildly retarded persons exhibit an apparent inability to retain their jobs for any length of time....
>
> ...It is therefore, essential, while these students are in their formative years, that they develop self-awareness and appropriate behaviour (Swan, 1983:1).

The Department of Education considers four areas of curriculum development for the O.A. classroom: vocational, domestic, recreational, and community (Hardes, 1986). Within these areas, the individual student is thought to need personal awareness programs, literacy/numeracy/oracy programs, realistic learning experiences, developmental movement programs, independent living skills, social/cultural/recreational awareness programs and community involvement programs. Class programs are to be at both whole of class and individual levels (Hardes, 1986).

2.A.4. A Further Literature Search for Definition of O.A..

A search through the current literature finds the issue of an O.A. child somewhat side-stepped for educational purposes, with confusion over necessary educational procedure and placement. There also appears to be a confusion of differing definitions. Whilst the following search reveals some literature which could suggest 25% of students falling within the O.A. range, others argue against any such claim. No doubt this situation is a relection of differing criteria and, differing philosophies.

Some argue, as exemplified by Dunn (1968), that a definition such as "mentally retarded" in effect provides excuses that relieve the educators of responsibility for intervention on behalf of these students. Since such a definition allows the problems to be viewed as "mental" and/or "genetic", the problem can therefore be viewed as irreversible. Olshansky, Schonfield and Sternfeld note:

> ..it is inaccurate. It suggests the existence of central nervous system pathology where there is no present evidence of such defect...(producing).. unhappy consequences for many of the children so described....(1971:110).

These authors support Dunn (1968) in claiming that this practice creates a convenient dumping ground, which especially affects children disadvantaged by poverty and minority group status.

However, others do allow for an innate learning disability that is attributed largely to limited cognitive ability. Otto and Smith, with obvious implications for acceptance of an O.A. categorisation, comment thus:

> A fact too often ignored in corrective and remedial programs is that- given a normal, bell-shaped distribution of cognitive ability- about one-fourth of the children in a typical school have substantially limited ability. The fact suggests that many children who fail to achieve at grade level do so because of their limited cognitive ability.... they tend to have I.Q.s roughly in the 70-90 range (1980:27).

Kirk and Gallagher (1979) demarcate four groups of learning disabled students for educational purposes, of which those labelled "educable mentally retarded" (I.Q. range 50-70 or 75) seem to fit the N.S.W. Departmental criteria for O.A. placement. These authors note the etiology, prevalence, school expectations and adult expectations of the "O.A." student thus:

> Etiology- predominantly considered a combination of genetic and poor social and economic conditions.
> Prevalence- about 10 in every 1,000 persons.
> School expectations- will have difficulty in usual school program, need special adaptations for appropriate education.
> Adult expectations- with training can make productive adjustment at an unskilled or semi-skilled level (1979:110).

Finally, in striving to understand the concept of an "O.A. student", it would be appropriate to recognize the behavioural and emotional aspects. Many learning disordered students suffer behavioural/emotional problems. As Heward and Orlansky discuss:

> Contrary to one popular myth, most emotionally disturbed children are not bright intellectually above-average children who are bored with their surroundings. Many more behaviour disordered children than normal children score in the "slow learner" or "mildly retarded" range on I.Q. tests....(1980:124).

Since the Doherty Report (1982) describes more than 3% of school children as behaviourally disturbed, it could be suggested that many such children end up in O.A. classes, as their poor performance in school subjects <u>plus</u> their inability to have their needs met in a regular class, easily target them for special placement.

This situation is discussed by Conway:

> The problem of the O.A. child is his inability to cope academically, emotionally or socially in the "normal" classroom situation. At the present time the child classified as O.A. is placed in a class with a number of other children who are also considered unable to cope with the "normal" classroom situation. Thus an O.A. class can be seen to be a place where problems are further compounded by the placement of children, incapable of coping with their individual problems and with other children, in a class which is far removed from the presently accepted "normal classroom situation (1985:Introduction).

2.A.5. Conclusion.

By definition, an O.A. student is one over the age of eight falling within an I.Q. range less than 80. The individual student is thought to need personal awareness programs, literacy/numeracy/oracy programs, realistic learning experiences, developmental movement programs, independent living skills, social/cultural/recreational awareness programs and community involvement programs, within a curriculum aimed at developing vocational, domestic, recreational, and community skills.

Despite much controversy over the acceptance of a definition for, if not existence of, the O.A. student, it does appear that some students' needs cannot be adequately met in a regular classroom, despite resource teachers and other supporting professionals. Therefore, special classes are considered necessary to develop and enhance self-concept (Hay, 1983; Swan, 1983), and to offer the strategies which cannot be provided readily by the classroom or subject teacher (Swan, 1976).

It is worth stressing at this point, that regardless of any individual preference for acceptance or non-acceptance of a category such as "O.A.", all students in this study have been selected within N.S.W. Department of Education criteria, as set out above, for special placement in a segregated O.A. class.

Part B. Integration: The Impetus Behind the Search For A More Effective Learning Strategy.

2.B.0. Overview.

Integration is currently the most widely discussed issue relating to the education of disabled children (Gow, Balla, Hall, Konza & Snow, 1986; Report of the Working Party on Special Education on Commonwealth Policy and Directions in Special Education, 1985). One of the most compelling reasons for this is the simple fact that many students with special needs are already in the regular classroom (Andrews, 1983; Konza, Gow, Hall & Balla, 1987; Thorley & Mills, 1986; Warnock, 1976) and must be dealt with in some way. This situation has led to the need for more attention to be focussed on teaching strategies, not only for the facilitation of skills acquisition, but also for the generalisation and maintenance of those skills (Conway, 1986).

2.B.1. Departmental Policy.

All N.S.W. students, whether in the mainstream or special classes, are affected by Departmental policy on integration.

The mainstream student is directly affected by the Memorandum to Principals: Enrollment of Children with Disabilities, in which it is clearly stated:

> It is policy of the Department that every child should be able to attend the regular neighbourhood school where it is possible and practicable and in the best interests of the child...(Winder, 1985).

Similarly, the O.A. student is affected, not only because the current Departmental policy on integration leads more parents of potential "O.A." students to demand regular class placement, but also because of closer adherence to the earlier statement on Remediation:

> The O.A. teacher...needs to take into account a number of very important factors is the child is to be in the least restrictive environment and have a classroom environment that is conducive to learning.....
>
> Full opportunity for integration must exist......
>
> No child should be regarded as terminally placed.... (Swan, 1976).

Throughout Australia, it is generally found that the ideology for integration has been widely accepted (Bochner, Salamon & Richardson, 1985; Clunies-Ross, 1983; Gow, 1986; Gow, Balla, Hall, Konza & Snow, 1986; Hall, Gow & Konza, 1987). Whilst there still remains much concern over the level of support required by the regular teacher (Hall & Gow, 1986; Hall et. al., 1987; Konza, Gow, Hall & Balla, 1987; Parmenter & Nash, 1987), some recent case studies on feelings of teachers and parents towards integration of students with disabilities reveal an overall positive attitude (as exemplified by Parmenter & Nash, 1987).

2.B.2. The Call for More Effective Learning Strategies.

Integration should be a "lifegoal", to enable the individual student to become a participating and contributing member of a whole society (Gow et. al., 1986). Indeed, to meet this challenge:

> The great diversity of teaching and learning strategies used by special education teachers to meet the great variety of needs of children with disabilities has been a tribute to their ingenuity and skills (Conway, 1986:16).

The ideology of Least Restrictive Environment and Integration are consistent with the N.S.W. Department of Education's "Cascade of Services" (see section 2.A.1) (Doherty, 1985:6). The commitment to the goal of education for all children, irrespective of handicapping severity, has grown only because learning theorists have entered the field to show what could be achieved by improving instructional procedures for more effective learning (Thorley, Martin & Jardine, 1986).

2.B.3. Conclusion.

The current contribution and probable future contribution of learning theory is allowing for radical changes in the servicing of children who pose problems for regular education. Some believe even more far-reaching developments will be realized within the next decade (Conway, 1986; Thorley _et. al._, 1986). This is exemplified by the developments in cognitive-learning strategies following a realization that the previously preferred ABA techniques are falling short of expectations, particularly with respect to generalisation and maintenance (see Chapter 2 Part E).

Part C. Applied Behaviour Analysis: The Previously Preferred Instructional Technique for the Intellectually Disabled.

2.C.0. Overview.

Cognitive theory is currently questioning ABA techniques. Section C summarizes the stages of development of Applied Behaviour Analysis (ABA), and examines the beginnings of the "new wave" of cognitive theory. This thesis uses the term Applied Behaviour Analysis (ABA) to encompass the variations and often interchangeable terms of Behaviour Modification, Behaviouristic Approach, Behaviour Therapy, Operant

Conditioning and Instrumental Conditioning (see Gow, 1987).

2.C.1. Background: The Beginnings of Applied Behaviour Analysis.

Perhaps the person most responsible for the acceptance of Applied Behavior Analysis was John Broadus Watson. Watson was the first person to obtain a Ph.D. in psychology from the University of Chicago (Johnson, 1979) and some term him as "the first explicit behaviorist" (Skinner, 1974). In 1913 he published a paper in The Psychological Review entitled "Psychology as the Behaviorist Views It" (Johnson, 1979; Skinner, 1974; Wolpe, 1983). This was followed by his 1919 book "Psychology from the Standpoint of a Behaviorist" (see Watson, 1983) and his 1924[?] book "Behaviorism" which were based on the original statement of the paper. Watson attacked the orthodox psychology of the day and, "inaugurated behaviorism as a new school of psychological thought" (Johnson, 1979:212). Watson contrasts "the old psychology and the new" (Watson, 1924[?]:3) by explaining:

> ...all schools of psychology except that of behaviorism claim that "consciousness" is the subject matter of psychology. Behaviorism, on the contrary, holds that the subject matter of human psychology is the behavior or activities of the human being. Behaviorism claims that "consciousness" is neither a definable nor a usable concept; that it is merely another word for the "soul" of more ancient times. The old

> psychology is thus dominated by a kind of subtle religious philosophy (Watson, 1924[?]:3).

Watson claimed his Behaviourist platform to be founded upon natural science and recognizing only of that which could be observed (Watson, 1924[?]: Watson 1983). As a result, all subjectively defined observations (e.g. sensation, perception, image, desire, purpose) were dropped from the Behaviourist's scientific vocabulary (Watson, 1924[?]). By the time of his death in 1958, Watson had exerted great influence on the fields of psychology and education (Johnson, 1979).

One of the earliest researchers to combine theory with important discovery, facilitating the acceptance of the field of ABA, was Ivan Pavlov (Good & Brophy, 1980). Pavlov had his book "Conditioned Reflexes" translated and published in English in 1927 (see Pavlov, 1960). This Russian psychologist produced much information about what is now referred to as "classical conditioning"; that is, the exhibiting of learned behaviour which occurs if a new stimulus is presented before an already-learned stimulus-response sequence (Good & Brophy, 1980). In his famous experiments with dogs which spanned twenty-five years (Pavlov, 1960), Pavlov demonstrated that the unconditioned stimulus (food) caused the unconditioned response (salivation), but, when the conditioned stimulus (bell) was paired with the unconditioned stimulus (food), the conditioned response (salivation) would result from the conditioned stimulus alone (bell) (Johnson, 1979). Pavlov's experiments, which were based on "strictly objective methods" (Pavlov, 1960:6) indicated that "systematic environmental manipulation could produce new associations" (Good & Brophy, 1980:112).

About the time that Pavlov was experimenting with dogs in Russia, the American psychologist Edward L. Thorndike was experimenting with cats (and later, dogs and chickens) (Johnson, 1979; Pavlov, 1960). Thorndike placed hungry cats in a cage. These cats obtained food by correctly manipulating the doors' release mechanism. In what has become central to ABA, Thorndike insisted that if the researcher could not see, measure and record the object of study, then the observation was unscientific and therefore not worthwhile (Johnson, 1979). In this somewhat naturalistic situation, involving trial-and-error, Thorndike developed his theory about what has come to be called instrumental conditioning (Good & Brophy, 1980). In applying this theory to human behaviour, Thorndike states:

> We change our reactions to various situations, that is, learn, without thinking about them or getting new ideas about them. This is done (e.g., in learning to ride a bicycle) by the elimination (generally gradual) of the useless acts and the

> reinforcement of the successful ones (see Thorndike, 1975:47).

His animal experiments convinced Thorndike that reinforcement was of central importance for learning (Johnson, 1979). Thorndike summarised his findings in his law of effect, which states that the connections between stimuli and responses are strengthened by satisfying consequences (Johnson, 1979). This connection is evident in the classroom thus:

> Amongst school subjects such things as control of tools, holding the pen correctly, improving of handwriting.....and singing, are learned largely by this gradual selection of the successful movements. In such cases the work of the teacher is naturally to stamp out the failures by making the pupil feel uncomfortable at them and to stamp in the successes by approval....Moreover, this must as far as possible be done at or near the time of the performance (see Thorndike, 1975:47).

Thorndike's work effectively extended the work of Pavlov on classical conditioning by showing that experimental manipulations could effect conditioned responses as well as conditioned stimuli (Good & Brophy, 1980).

In 1943, Clark Hull introduced what was termed as Quantitative Behaviourism, which remained for a period of time, the most influential theory in psychology in the United States (Good & Brophy, 1980). Contrary to Thorndike's commitment on scientific observation, Hull introduced what he termed "organismic variables", which were hypothetical constraints dependent on the organism's needs and drives (e.g. thirst, hunger) (Good & Brophy, 1980). Hull states:

> There exist in varying degrees certain conditions in the body, such as lack of nutrition, water, or oxygen, the ample presence of the appropriate sex hormone....these constitute conditions of primary drive....Ordinarily these drive conditions, if intense enough, release innate behaviorial activities... which tend to recify the biological emergency involved...For example, the vigor of an animal's struggle for food or water increases, other things equal, with the number of hours of food or water privation up to the point of beginning weakness from inanition (Hull, 1951).

Through his work in Quantitative Behaviourism, Hull and his adherents broadened ABA theory to take into account the innate motivation of the organism (Good & Brophy, 1980).

2.C.2. B. F. Skinner.

The psychologist who is most responsible for the theory of ABA, as seen today, is B. F. Skinner, who has done most to develop and apply the ideas originally proposed by Thorndike (Johnson, 1979). Preferring rats as his research subjects, Skinner constructed the Skinner box which was equipped with a bar (that could be depressed) and a food tray. Bar pressing behaviour was reinforced by food. From observing this behaviour, Skinner developed the theory of ABA through what he termed **operant conditioning** (Mercer & Mercer, 1981). Operant conditioning is based on the simple rule that behaviour is influenced by its consequences and for this reason "consequences themselves are called reinforcers" (Skinner, 1974:39). In an interview, Skinner states that behaviour can be changed or modified through the "manipulation of the pay-off" (Australian Broadcasting Commission, 1978:35). Skinner and his colleagues also proved that maintenance of a behaviour was stronger and more lasting when maintained with partial reinforcement (Good & Brophy, 1980; Johnson, 1979), and emphasised contingent reinforcement as the basic mechanism that explains learning (Good & Brophy, 1980, Skinner, 1974). Skinner's development of ABA techniques proved "especially valuable to noncommunicative children" (Kirk & Gallagher, 1979:170) as it was not reliant on language skills.

During 1978 Skinner visited Australia. During this visit, Skinner gave a series of interviews to the Australian Broadcasting Commission. In these interviews it was recalled that during the early sixties, Skinner had extended his animal studies (which by now included pigeons) into human studies working with prison inmates, psychiatric patients, military personnel, school children, infants and the intellectually disabled. Skinner commented

> I do not believe that a person acts because of ideas or feelings or attitudes or states of mind, or any internal entity of that kind. I think those are by-products. I think people behave as they do because of the things that have happened to them

> and I would include among those the things that happened in the evolution of the species. This is an emphasis on the outside world rather than on the inner determiners...what they actually do...is determined by what has happened to them (Australian Broadcasting Commission, 1978:36).

2.C.3. Early Criticism of Applied Behaviour Analysis.

While ABA theory was implemented in many regular and special schools throughout the world, as exemplified by the Mangere Guidance Unit in Auckland (see Glynn, Thomas & Wotherspoon, 1978), some felt that his work with the "Skinner Box" ignored all the most important social behaviour (e.g. exploratory behaviour), and that the situations on which the theory had been built was too simple to explain complex human behaviour (Australian Broadcasting Commission, 1978). In addition, some claimed that ABA had discarded the person, leaving Skinner's theory to be described as an "empty organism" theory (Hunt & Sullivan, 1974).

2.C.4. Recent Criticism of Applied Behaviour Analysis.

ABA techniques have come under most criticism for failing to result in the generalisation of skills from one situation to another (Conway, 1986; Gow, 1987; Gow, Burton & King, 1988; Gow, Ward and Balla, 1985; Maker, 1981). However, it should be noted that some see this as a result of a basic failure to apply ABA methods adequately rather than from any inherent limitations to this approach (Ward and Gow, 1982). This is exemplified in the criticism of token economies, in that the aim has frequently been to change student behaviour for the convenience of the teacher, rather than for any variable directly related to student learning (van de Ven, 1987).

A major problem with ABA techniques is that many of the strategies used in the classroom have emerged from clinical and highly controlled experimental procedures, with the result that there followed an over-focussing on teaching specific skills in specific situations (Conway, 1986). This has led, sometimes to the teaching of non-functional skills and the use of non-functional teaching strategies, without adaptation to individual needs (Conway, 1986).

Gow (1987) notes deficiencies in applied behaviour analysis as being;

1) some of the procedures have failed to affect significantly the behavior of a certain number of subjects,

2) some of the procedures do not work consistently with all subjects, that is, a particular procedure may work for a limited period of time, but be unsuccessful over an extended time,

3) some procedures do not result in a generalisation of training effects,

4) often, on withdrawal of the program, the trained behaviours are not maintained.

2.C.5. Conclusions.

The almost exclusive focus of ABA on merely changing behaviour for a specific task has led research to pay insufficient attention to generalisation. Despite the warning of this "Train and Hope" tactic (identified by Stokes and Baer in 1977), the neglect of teaching for generalisation strategies has led to a pedagogical practice in which generalisation is expected to happen without programming (Ward & Gow, 1982). This in turn has led to students who have learnt to react with a desired response but only within the extremely limited experiences offered in a classroom or training environments (Ward & Gow, 1982). The learner has not been given the opportunity to develop internalized strategies for approaching new tasks, and therefore, s/he becomes welded to the training situation. In addition, the use of ABA in instruction externally controls the learner, as the instructor (rather than the learner) decides on the goal and the means of reaching that goal.

Part D. Cognition and Metacognition: Background to the New Wave of Problem Solving Theory.

2.D.0. Overview.

It was argued in Part C that the previously preferred Applied-Behaviour Analysis techniques lacked the capacity to enable the learner to generalise skills from particular tasks to other tasks. Part D of this chapter provides a literature review discussing the new wave of cognitive and metacognitive theory which is claimed by its developers to enhance generalisation of skills.

2.D.1. Background: The Intellectually Disabled.

As noted in Section 2.A.0., research by Havertape and Kass (1977) concluded that in many cases, intellectually disabled students have few attack strategies to apply to problem solution, and further deduced that those who possess some strategies do not use them effectively. Butterfield and Ferretti summarize the developmental and cognitive literature and show five kinds of cognitive differences between people of different ages, and differences between people of same age but different I.Q. They conclude that younger and less intelligent persons:

1. have smaller memory capacities or less efficient memory processes,
2. have smaller and less elaborately organised knowledge bases,

3. use fewer, simpler and more passive processing strategies,
4. have less metacognitive understanding of their own cognitive systems and how the functioning of these systems depends on the environment,
5. use less complete and flexible executive processes for controlling their thinking (1985:3).

2.D.2. New Wave of Cognitive Theory.

Some cognitive models in the new wave of cognitive theories are the Meichenbaum Model (see Part F), the Gow model (see Part F), and the Instrumental Enrichment model of Feuerstein (see Section 2.D.2.1.).

In contrast to these more content-free cognitive theories, there are several examples of cognitive theories which relate to specific subject areas. Sternberg, Ketron and Powell (1982) present a view for the development of verbal ability as deriving in large part from the use of skills for acquiring incidentally the meaning of unfamiliar words presented in everyday contexts. Similarly, Collins and Smith (1982) contend that there are two aspects of reading comprehension: comprehension monitoring, hypothesis formulation and evaluation. They claim that comprehension monitoring falls within the domain of executive processing (see Section 2.D.5.1) as it concerns a person's ability both to evaluate ongoing comprehension processes while reading through a text, and to plan remedial action when one's comprehension processes are seen to be failing. Palincsar and Brown (1984) researched comprehension fostering and comprehension monitoring cognitive skills training with "impressive findings" (p167).

2.D.2.1. The Feuerstein Instrumental Enrichment Model.

The beginnings of the new wave of cognitive theory can perhaps be traced to Reuven Feuerstein, a clinical psychologist, who became involved with the assessment of children (notably adolescents) who were being resettled in Israel following World War II. Many of these children were the victims of the Holocaust and most were from situations of dire poverty and deprivation (Messerer, Hunt, Meyers & Lerner, 1984; Yates, 1987). Feuerstein observed that many of these children demonstrated specific cognitive deficits while they were engaged in a problem solving task (Messerer et. al., 1984). Feuerstein's Instrumental Enrichment model is based on the belief that "...the cognitive behaviour of the human organism represents an open system amenable to meaningful structural change" (Feuerstein & Jensen, 1980:402).

There are six main goals to the FIE model (see Feuerstein & Jensen, 1980), a summary of these being:

1. To correct weaknesses and deficiencies in cognitive functions.
2. To help students learn and apply the basic concepts, labels, vocabulary, and operations essential to effective thought.
3. To produce sound and spontaneous thinking habits leading to greater curiosity, self-confidence and motivation.
4. To produce in students increasingly reflective and insightful thought processes.
5. To motivate students towards task-orientated abstract goals rather than towards objectives of impulsive self-gratification.
6. To transfer poor learners from passive recipients and reproducers of information into active generators of new information (see Yates, 1987:17).

FIE is an intervention program implemented in the classroom through the utilisation of paper-pencil exercises which are presented to the student page by page by a specially trained teacher (Feuerstein & Jensen, 1980). An important factor in the success of this model is the teacher who shapes the opportunities through which the mediated learning experiences occur, and brings them to the attention of the learner (Messerer et. al., 1984).

2.D.3. Effectiveness of Cognitive Training.

Cognitive training appears to result in more generalisation of skills than applied behaviour analysis. In a 1979 review of the effects of three intervention strategies: medication, behaviour modification, cognitive training, it was concluded by Keogh and Barkett:

> ...although different interventions generally influence different aspects of performance, cognitive training appears to offer the greatest possibility of transfer or generalization (see Maker, 1981:137).

However, it may be important to note that the cognitive theories listed in section 2.D.1 are all specifically designed for students/trainees with some form of learning disability as opposed to students who are experiencing no problems in their daily learning tasks. A possible constraint to the success of the teaching of a cognitive model is expressed by Maker:

> Also important to the success of a cognitive modification approach is a consideration of the age and maturity of the children involved. While younger children may lack the verbal or physical competencies needed to use the strategies, overt self-instruction may interfere with the performance of older or high I.Q. children.....it seems that once a behavio has been mastered and is regulated by private speech, imposition of overt verbalization interferes with performance (1981:138).

The literature examining this possible constraint is somewhat conflicting. A study by Hall and Gow (see Pilot Study, Appendix 4) found that teaching the cognitive Self-Instruction Problem Solving technique to a group of <u>normal intelligenced</u> pupils who were blind, had little effect on the majority of these students. However, a study by Martin (1984) found that teaching the cognitive Feuerstein's Instrumental Enrichment model to a group of <u>normal intelligence</u> pupils who were deaf, produced an improvement in the experimental group in their systematic approach to solving problems.

A further consideration in the assessment of the effectiveness of any cognitive-behavioural approach is the teacher. Feuerstein recognizes this important factor and the teachers of FIE are expertly trained (Feuerstein & Jensen, 1980; Messerer <u>et. al</u>., 1984; Yates, 1987). Similarly, Morsink, Soar, Soar and Thomas (1986) note that the "ideal" amount of teacher control of learning activity changes with the cognitive level of the outcome. In particular they note that complex problem solving requires a specific teaching style to facilitate information processing. Rather unfortunately, Morsink <u>et. al</u>. (1986) note that the teaching styles exhibited in most primary classrooms for disadvantaged pupils appear to have an adverse effect on problem solving!

2.D.4. Metacognition.

Ellis (1986) notes the three popular aspects of metacognitive training. These involve: the teaching of students to consider the many variables involved in problem solving, the teaching of students to regulate processes involved in problem solving (planning, checking, testing etc.) and increasing student effectiveness in the use of specific cognitive skills employed while problem solving. Butterfield and Ferretti's concept of base knowledge exemplifies these aspects:

> ....information about the referents of terms and information about the relationships among terms and their referents (1985:4).

Base knowledge is thought to be organized into domains (Butterfield and Ferretti, 1985), i.e. groups of terms and referents that are closely related at the level of events, and exemplified by a person learning that a collie and a beagle are both dogs, whereas a siamese and a calico are both cats.

A perspective on metacognition is gained through a knowledge of what researchers have labelled subordinate and superordinate processes (Borkowski & Kurtz, 1984).

2.D.5. Subordinate and Superordinate Cognition.

There is consensus in the literature that distinguishes between subordinate and superordinate processes. Subordinate processes are cognitive strategies such as rehearsal, elaboration, and organised memory search. Superordinate processes coordinate, monitor and modify subordinate processes (Borkowski & Kurtz, 1984). However, the dilemma for researchers in measuring these processes continues, for these are cognitive functions, but investigators who study them can only measure behaviour (Butterfield &

Ferretti, 1985). An example of such a study is seen in Butterfield and Ferretti:

> Investigators of normal development and atypical children were lead to consider superordinate cognition by the results of instructional research. First there was the finding that children who otherwise perform poorly, perform well beyond their age mates when given simple instructions in how to solve any variety of cognitive problems.......Second, there was the finding that having been instructed to use an effective strategy for one problem, children would regularly fail to use that strategy on another problem for which it would be just as effective.......in short, swift and dramatic responses to instruction, coupled with failures to transfer prompted investigators to entertain the hypothesis that young and less intelligent children lack superordinate cognitions (1985:21).

2.D.5.1. The Architectural and Executive Systems.

Research by Campione and Brown in 1978 (see Borkowski, 1985) noted the two systems of cognitive functioning thought to be necessary in the learning and generalisation process. These were labelled:

1. the architectural system; and,
2. the executive system.

Within the cognitive processes these two functions are unique yet interrelated. The subordinate architectural system has the function of registering and responding to sensory input. It is considered that the, "more biologically rooted architectural system, critical for the efficient registering and assessing of information, is probably immune to pronounced, immediate, and direct alterations through intervention" (Borkowski, 1985:111).

The superordinate executive system initiates and regulates retrieval of knowledge from long-term memory, modifies the knowledge base, and facilitates problem solving (Butterfield & Ferretti, 1985). Executive routines are procedures that control strategic processing through diagnosing and monitoring strategy implementation (Butterfield & Ferretti, 1985). In contrast to the architectural system, "the components in the more environmentally based executive system are highly modifiable" (Borkowski, 1985:111).

There is considerable consensus in the literature that generalisation outcomes are dependent on the availability of executive skills (Butterfield & Ferretti, 1982; Gow, 1985) such as strategy awareness, selection, initiation, regulation/monitoring, revision/modification and co-ordination of strategic routines that guide the deployment of specific control processes. Direct executive training of problem solving strategies is exemplified by the work of Collins & Smith (1982) who stressed the decontextualisation of skills in subject areas such as reading and verbal comprehension through the direct training of comprehension monitoring skills.

Some believe that an understanding of executive processing is a prerequisite for understanding of intelligent behaviour (Sternberg, 1982; Sternberg, Ketron & Powell, 1982). Research suggests that executive processing seems to play a key role in task performance, "probably without regard to the particular task being studied" (Sternberg, 1982:143).

The concern of other researchers with executive processing is evident in their conceptualisation of "distancing", whereby an individual is stimulated to reconstruct the past, anticipate the future, and take different perspectives on the present (Messick and Sigel 1982). In distancing, the individual breaks away, briefly at least, from the specific context in which a task is being performed and attempts to put his or her task into a broader perspective, thus stimulating cognitive development.

The "distancing" model is based on the Piaget notion that the development of cognitive competence stems from the interaction of specific classes of social experience and the child's developmental status. Butterfield also refers to what can be compared with the Piagetian notion of "assimilation" and "accommodation" (see Good & Brophy, 1980; Johnson, 1979) in his noting of the function of executive processes:

> When applied to a difficult and novel problem, the same executive routines that allow current problem solution result in transfer and they enlarge one's knowledge base or change its representation; delete, modify, or add strategies to one's repertoire and create new metacognitive understanding (1987:2).

Glaser and Pellegrino (1982) illustrate the importance of executive processing in analogical reasoning by showing that low ability children often fail to solve analogies successfully, in part because they do not construct a strategy for "analogical" solution of analogies. They claim that analogical processes such as encoding, identification and generation of relational features, rule assembly or rule monitoring, comparison and matching are general across induction tasks and the context in which these tasks are presented.

In summary, while in practice they are inferred only from their use (Butterfield & Ferretti, 1985) it is the organisation, or lack of organisation, of the architectural and executive systems which may explain failures in generalisation (Borkowski, 1985). It is the conscious effort to organize the cognitive process, that is, the architectural and executive systems, which lay the ground for metacognitive theory.

2.D.6. Metacognitive Understanding.

Metacognitive understanding, "is information about one's self as a thinker and his or her own base knowledge and strategic repertoire" (Butterfield & Ferretti, 1985).

Spurred by the elusive aim of achieving generalisation through metacognitive understanding, Grover and Wight-Felske (1986) hypothesized that if intellectually disabled learners knew something of the conditions under which they learnt best, they could take charge of their own learning or executive processing. To test the hypothesis Grover and Wight-Felske (1986) conducted a study with a group of 40 intellectually disabled adults (20 men and 20 women) randomly selected from a comprehensive training facility. They identified teaching principles as follows: moderation of speed, moderation of decibel level, combination of oral and visual demonstration, provision of feedback, presentation of small units of new learning, repetition, individual attention and sequencing. The three general research questions addressed were: "What do mentally retarded people know about the instructional techniques which affect their learning?", "Do they apply this knowledge or awareness in choosing optimal instructional sequencing if given the opportunity?", "Can this selection and monitoring skills be trained?" (Grover and Wight-Felske 1986:3)

Grover and Wight-Felske (1986) found that, while the subjects could recognize optimal teaching strategies in a forced choice task, they had difficulty in analyzing a learning situation.

2.D.7. Metamemory Variables.

Borkowski and Kurtz (1984) distinguish a specific form of metacognition. They termed this process metamemory, and note that metamemory refers to, "knowledge a person has about the factors influencing memory activities" (p.193). Three variables that interact to influence performance on memory tasks are: person, task and strategy variables. These researchers concede that in many respects metamemory is difficult to define, noting that it is a "fuzzy concept" (p197). However, they operationally define metamemory as, "verbalized knowledge about memory.... (being).... information about memory, stored in long-term memory like any other type of domain-specific information" (pp197-198). Research by Peck in 1980 (see Borkowski & Kurtz, 1984) revealed, "the extensive differences in metamemorial knowledge for gifted children.... (compared to)... average children (Borkowski & Kurtz, 1984:205). This led Borkowski and Kurtz to hypothesize:

> ...metamemory provides the context in which strategy acquisition takes on a more general, durable character. If this hypothesis is correct, the development of a mature metamemory is an antecedent to successful strategy training and its transfer to more general contexts (1984:206).

2.D.8. Strategy Training.

Strategies are, "procedures for processing pieces of base knowledge" (Butterfield & Ferretti, 1985:5) (e.g. visual recall or imagery strategy; and, repeating of labels or rehearsal strategy). Cognitive strategy training is designed to improve learning effectiveness and frequently some steps within a cognitive strategy cue students to use metacognitive skills (Ellis, 1986). Strategy training for the intellectually disabled may well prove the elusive goal of the nineteen eighties, for as Borkowski and Kurtz conclude:

> It is perhaps premature to speculate on why and how a theory with 'fuzzy' concepts and uncertain construct validity might be extended to naturalistic settings. Nevertheless, we conclude.....
> 1. Reliable test of metamemory may prove useful in diagnosing children in need of study and learning-attack skills......
> 2. .....strategy-metacognitive training packages should include self-attribution retraining. It seems critical for minority children....that failure does not imply a lack of ability....
> <u>3. Mentally retarded, learning disabled, and impulsive children might receive special boosts from metacognitive training, by improving their</u>

> ability to profit from strategy instructions... (1984:211-212) (researcher's underline).

Research in 1979 by Hallahan and Kneedler (see Borkowski & Kurtz, 1984) revealed that many learning disabled children do not lack attention or memory abilities as much as they lack task-approach skills; that is, they appear deficient in knowledge about how to perform tasks that require concurrent attention and memory. Hallahan and Kneedler found that once the learning disabled children were instructed to use appropriate task strategies, they often performed memory tasks as well as normal children.

The literature also reveals that older children attend to central information and ignore the irrelevant; however, intellectually disabled children, being about two years behind their normal age peers display an apparent inability to use task appropriate strategies (Borkowski & Kurtz, 1984). As this deficit may be at the root of the selective-attention problems of the learning disabled, Borkowski and Kurtz state:

> When LD children are taught strategies such as verbal rehearsal and clustering, their selective attention skills become comparable to those of normal peers.... (1984:207),
>
> In summary, work with LD children is in accord with findings related to other special children. Learning deficits are, in part, attributable to failures to implement appropriate task strategies, rather than deficits in memory or attention per se. Absence of, or deficiencies in, strategic implementation is paralleled by slowed metamorial

> development in LD, impulsive, and retarded children (1984:208).

Borkowski and Kurtz note, "A strategy, by definition, must be goal-directed.... (and therefore)....used to enhance performance on a particular task" (1984:208). If a strategy is to be durable, the child must understand why the strategy should be employed, therefore adequate instruction must include explanation as to why the strategy should be employed. The child should not merely copy the tactics of an experimenter, "without understanding the reasons for those tactics" (Borkowski & Kurtz, 1984:208). Mere copying is not really behaving strategically and the newly learned procedure, "will be neither durable nor general" (Borkowski & Kurtz, 1984:208).

Future training studies should seek to obtain a better match between metacognitive training and strategy training (Borkowski & Kurtz, 1984). To this objective Gow (1987) has developed the Self-Instruction Problem Solving Model which can be seen as a further evolution of the Meichenbaum model (see Gow, 1987; Gow, Ward & Balla, 1985; Ward & Gow, 1982). SIPS seeks to provide the learner with a portable and durable strategy to enhance the generalisation of skills (see Gow, 1987).

2.D.8.1. Strategy Training and Behaviour.

Wragg (1987) offers a compliance training course for conduct disordered children and adolescents. While this program relates specifically to conduct disordered children and adolescents, Wragg stresses the need to, "train the child's thinking" (p.2). He maintains that even at the age of 4-5 years:

> .....it is important to recognize that the child's behaviour is controlled by his or her thinking and in order to direct his behaviour we must train his thinking wherever possible (1987:2).

Wragg (1987) ascertains that through the training for compliance, by means of verbalisations through a set instructional maze (including the introduction of "pests" and "blockers"), children can be taught to develop the cognitive skills necessary to control their behaviour.

Cross (1976), in discussing "cognitive style" states, "people probably learn habitual ways of responding to their environment early in life" (p.119). However, like Wragg (1987), Cross believes that people can be taught active cognitive strategies which will affect behaviour.

This interest in the development of an individual's cognitive style is more recently addressed by Borkowski and Kurtz (1984) in their research into the relationship between impulsivity, metamemory and transfer. They reasoned, "metamemory rather than cognitive tempo dictates strategic behaviors in children, both normal and retarded, who are impulsive" (p.203). As a result of their research, Borkowski and Kurtz suggested:

> ....metamemorial processes of impulsive and reflective children served as a mediational base during strategy maintenance and generalization. If this interpretation is tenable, training instructions should focus as much on enhancing metamemory as on teaching strategies. That is, we should teach impulsive children why strategies are effective as well as when, where, and how they become appropriate learning aids (1984:204).

The idea that children fall into habitual ways of thinking and responding is further developed by Okabayashi and Torrance (1984). In their study to determine why "gifted" students still fell into ranges of high, good and low achievers, Okabayashi and Torrance found:

> (high achievers).....seem to have developed skills in using an integrative style of processing information, using both the specialized cerebral functions of the left hemisphere and those of the right hemisphere, either in conjunction with one another or shifting from one to the other as demanded by the nature of the task. On the other hand, the low achievement group reported a stronger preference for using a right style of information processing (1984:106).

2.D.9. Conclusion.

Largely because of the persistent difficulties reported with applied-behavior analysis (ABA) techniques in achieving generalisation, there has been a dramatic move in recent years away from the traditional approach of ABA. Much interest is currently being expressed in the possibilities of teaching "thinking skills" to people with intellectual disabilities (Yates, 1987). Similarly, there has been a move towards more cognitive approaches when dealing with conduct disordered students. There is consensus in the literature that education of students with intellectual disabilities should continue to move towards more cognitive approaches. These approaches emphasize problem solving (see Gow, Ward & Balla, 1985).

Part E. Generalisation

2.E.0. Overview.

Generalisation and maintenance are an important but neglected area of the education system (Gow, 1985; Ward & Gow, 1982), not only in the field of students with Learning Disabilities but with education in general. This neglect has led Gow (1985) to claim that the greatest challenge facing teachers of people with intellectual disability is obtaining generalized responding and has led Butterfield to state:

> Historically, transfer has been considered something that sometimes happens to what has been learned, and it has been considered a passive happening related more to environmental variables than to cognitive structures or mechanisms. Many theorists have tried to account for learning, but until recently none have conceived of transfer as a phenomenon that required its own explanation (1987:1).

As discussed above, teaching strategies for intellectually disabled once derived from ABA techniques, with the results obtained proving "very disappointing, to say the least" (Ward & Gow, 1982:231). Indeed, Butterfield and Gow in delivering their 1987 international paper prick at the very structure of modern education by stating:

> Determining how to induce students to generalize their learnings is arguably the most important unsolved problem of education and psychology. We send children to school to become broadly effective in life, not to do well in school alone. Unless students' academic lessons transfer to their lives, schools have failed (1987:2).

2.E.1. Generalisation or Transfer?

The literature regarding generalisation has not only reflected origin-specific spellings (generalization), but to a large degree has also reflected origin-specific jargon. Generalisation has a similar meaning to transfer, and indeed, "some efforts at conceptualisation have tended to use the terms interchangeably...to such a degree, that the terms must be read in context for understanding" (Ward & Gow, 1982:233).

The terms "generalisation" and "transfer" are further complicated by them often being paired with "maintenance" within the same sentence and as an aim/outcome of the same intervention program. Ward and Gow offer guidelines for this dilemma, thus:

> Maintenance most properly refers to the durability of treatment effects following a formal intervention procedure. In one sense therefore it refers to consequence events, whereas generalisation is related to events which may be experimentally identified and represented both in training procedures and afterwards........ (1982:233).

Ward and Gow note that some claim "transfer" as a more complex process than "generalisation", citing Brown, Campione & Barclay who in 1979 described "transfer" as:

> ..... performance on a task that differs in some way to any previous task on which the individual has been trained, and thus transfer is a more complex process than generalisation, involving executive functioning (1982:233).

However, Ward and Gow (1982) conclude that "generalisation should serve as the generic term" (p233). Furthermore, these authors state:

> For most educational purposes, generalisation may be regarded...... as an adaptive process by which the properties of the stimulus, class or problem, are abstracted and made available for subsequent discriminations or problem solving (1982:233).

To identify and classify generalisation Ward and Gow (1982) give a taxonomy of generalisation outcomes, summarzed thus:

a) Stimulus generalisation. This is a generic outcome subsuming transfer of training across settings, over time and to individuals not in training. Stimulus generalisation may concern either a single change of stimulus or a class of stimuli which control a single response, e.g. responding "hullo" to any of the following social stimuli, "hi", "how are you", "good morning".

b) Response generalisation. This requires the subject to extend the range of responses to the same stimulus or stimulus class, e.g. responding "hi", "how are you",or "good morning" to a stimulus "hullo".

c) Transfer of Strategy Use (particularly with reference to problem solving). This involves a more complex generalisation process than for either stimulus or response generalisation requiring the training of strategies for problem solving which are qualitatively different from those encountered in simple respondent or operant conditioning, e.g. discrimination learning, i.e. learning to discriminate when to use a certain learnt strategy such as assertiveness.

d) Transfer of High Level Strategies. This involves the selection, application and evaluation of strategies for use in complex problem-solving often described as metacognition. While usually an aim of advanced teaching, particularly in the field of advanced mathematics, it is often overlooked that in the field of social-interaction, many metacognitive processes are of equal complexity.

e) Unprogrammed Generalisation Outcomes. These are the indirect generalisations which are more good (or bad) luck than good programming. Unprogrammed Generalisation Outcomes include facilitating the production of new forms of behaviour (a form of response generalisation) and the transactional outcome of influencing the environment directly (in the sense that the individual can now act upon it in order, for example, to change the behaviour of others towards him). An example of the former would be the hope that subsequent reading progress comparable to that of regular grade peers, would follow an intensive remedial activity (often independent of the quality of future programs!). An example of the second situation is a retarded person now changing the behaviour of others towards him by the acquisition of social skills.

f) Generalisation of Effects. This term refers to non-complex adaptive behaviour of a general nature, such as increasing acceptable behaviour of an individual or group by implementation of a specific program(s), e.g. decrease self-stimulatory behaviour, increase socially acceptable responses to social stimuli.

2.E.2. Generalisation and I.Q.

As noted in section 1.0 Background to the Problem, intellectually disabled students do not use systematic, organized strategies but seem to solve problems in a random or impulsive manner. In not using active strategies for learning, there develops an inability to generalize a previously learned problem-solving strategy to a new problem. This in turn has "a general and pervasive effect on achievement in academic tasks, resulting in the inconsistent, almost random performance of some L.D. children" (Maker, 1981:146).

The intellectually disabled students' inadequate ability to generalize has been confirmed in some very recent studies. Campione, Brown, Ferrara, Jones and Steinberg (1985) investigated differences in strategy maintenance and generalisation between 25 intellectually disabled and 25 normally achieving children. Children were trained in problems adapted from the Raven Progressive Matrix test. Maintenance and generalisation were measured by the amount of help the children required to solve a problem. No group differences were found during training phase, but the intellectually disabled group required more help during maintenance and generalisation problems. The research found that group differences increased as the difficulty level of the problems increased.

Similarly, Ferrara, Brown and Campione (1986) investigated intelligence-related differences in maintenance and generalisation of strategy. This study found a strong relationship between learning efficiency and I.Q., plus a strong relationship between generalisation and I.Q. Higher I.Q. children required fewer prompts, with group differences increasing as generalisation distances increased.

Butterfield summarizes the literature and identifies four factors that may explain the relationship between generalisation and individual I.Q. He writes:

> The literature on cognitive differences among people identifies four factors that vary with age and intelligence and whose use might produce learning and transfer. Younger, less intelligent, and less expert people have been said [1] to have smaller and less elaborately organized knowledge bases; [2] to have fewer, simpler and more passive processing strategies; [3] to have less metacognitive understanding of their own cognitive systems and how the functioning of those systems depends on circumstances; and [4] to use less complete and flexible executive processes for controlling their thinking. When trying to account for intelligent behavior, learning, or transfer, different investigators have emphasized different ones of these four factors, but the current focus is on how the four combine to produce transfer.......one hypothesis about how these four factors combine is that intelligent action results when executive routines draw on base knowledge and metacognitive understandings to fashion strategies to solve problems (1987:2).

2 E.3. Generalisation: Cognitive Style or Metamemory?

Okabayashi and Torrance (1984) (see 2.D.8.1) felt that it was possible to teach individuals a better cognitive strategy to improve the habitual information processing procedure. Okabayashi and Torrance state:

> An implication suggested by the results of this study is that teachers of these gifted students might improve student achievement by helping many of the low achievers learn how to use both left and right hemisphere ways of processing information in conjunction with each other (1984:106).

As clearly this more efficient cognitive strategy involves an individual's knowledge regarding factors influencing memory activities (see 2.D.7), it is suggested by this researcher that Okabayashi and Torrance (1984) are therefore referring to Borkowski and Kurtz's (1984) concept of metamemory.

2.E.4. The Implications of Metamemory and Current Cognitive Theory.

Ferretti and Belmont (1983) note, "it is no surprise that contemporary efforts to understand intelligence have led to a rediscovery of adaptation and problem solving" (p58). These researchers in the field of cognitive theory propose that poor generalisation is a result of faulty problem solving procedures, and hypothesize:

> ...the conditions under which successful maintenance and transfer are achieved add not only to the child's fund of potential solutions, but as

> well must be adding to the store of problem-solving procedures and influencing internal representation as a whole (1983:61).

In 1984 Borkowski and Kurtz asked the question, "Is metamemory a precondition for successful strategy transfer?" (p.195), and through examination of the literature concluded that while the evidence was conflicting, there is a "metamemory-strategy use relationship" (p196). In the following year Borkowski (1985) explained that "production deficiencies" (p.124) are failures in metacognitive awareness. He went on to hypothesize that while children may have the necessary strategies for the task at hand, they could still "lack the knowledge regarding when, how, and why the strategies might be useful" (p124). Borkowski concluded that the metacognitive processes of metamemory and memory are tied to maintenance and generalisation, stating:

> Strategy transfer requires a decision about whether to use a previously learned rule or strategy, and how to adapt it to present task demands (1985:127).

To explain the importance of metamemory in the understanding of generalisation, Borkowski and Kurtz developed a set of seven working assumptions between metamemory and generalisation, being:

> 1. Metamemory should be linked more closely to strategic behavior than to recall accuracy. This is because metamemory is a setting variable for strategy use.

2. Metamemory should be related to strategic behavior only in limited contexts, such as during transfer or with novel tasks. On highly familiar or easy tasks where automatic processing is sufficient, metamemory should be unrelated to performance and to strategy use.
3. Bidirectional causality should define the connection between metamemory and strategy transfer. Metamemory enhances strategy generalization and, in turn, is enriched by it.
4. Although task-relevant memory knowledge is useful in acquiring a new strategy, task-irrelevant metamemory....is also important in understanding strategy transfer.
5. Metamemory operates at two levels: mediatingtask-specific strategies (subordinates) as well as executive strategies (superordinates).
6. The strength of metamemory-strategy connectionsshould change with development and be limited by other subject characteristics such as retardation, giftedness, and impulsivity.
7. Metamemory and strategy transfer should be related to personal traits, such as internal motivation and self-attribution style (1984:201).

2.E.5. Programming and Generalisation.

Methods used for promoting generalisation will largely depend on the nature of the behaviour to be learned, taking into consideration the task's position in an instructional hierarchy, its ecological validity and characteristics of the subjects (Ward & Gow, 1982). In their article Ward and Gow (1982) note that while the conventional framework for teaching for generalisation had traditionally derived from ABA techniques, there were notable variations. Ward and Gow (1982) exemplified Brown, Nietupski and Hamre-Nietupski who in 1977 "formed the prototype of many studies" (p.239) by recommending that skills taught should be performed:

> 1) in reaction to, or in the presence of, at least three different persons;
> 2) in at least three different natural settings;
> 3) in response to at least three different sets of instructional materials;
> 4) at least three different appropriate language cues (Ward & Gow, 1982:239).

Ward and Gow note that of all the issues which arise in the problem of generalisation, probably the most important are those surrounding the design of interventions. They state:

> A promising feature of recent work is that there is now general agreement that any well-planned intervention must take into account the issue of generalisation (1982:245).

In more recent years Gow emphatically states,

> ....as research on generalisation phenomena has progressed, evidence has delineated the complexity and importance of this concept which had previously been considered merely a simple evaluative measure. Teachers of people with an intellectual disability must recognize that. although generalisation is a challenge, it can be achieved if it is systematically programmed and not merely hoped for. Furthermore, these teachers must realize that if generalisation is not demonstrated the efficiency of their teaching must be questioned (1985:13)

No doubt with this in mind, Gow (1985) proposed twelve programming steps to enhance generalisation, a summary being:

1. Transfer power to the learner -the learner should have the opportunity to complete the task before teacher intervention.

2. Ensure ecological validity of task and setting.

3. Use real objects rather than pictorial representations.

4. Teach across settings (including teachers, e.g. casual teachers, part-time teachers, grade supervisors).

5. Teach across tasks (i.e. plenty of examples to help aid generalisation).

6.Teach rules or general principles.

7. Directly teach the need to generalise the strategy.

8. Match the teaching situation to the individual characteristics of the learner (be sensitive!)

9. Examine ways of enhancing individual motivation through: a) Selecting tasks of interest value to the learner, b) Ensuring the active participation of the learner, c) Ensuring the learner knows what the task is about.

10. Exercise caution in the use of feedback. Feedback can reduce training efficiency by deterring the learner from becoming self-regulating and from seeking intrinsic reinforcement.

11. Facilitate the development of self-management skills (using verbal self instruction techniques).

12. Teach a problem solving approach to learning.

2.E.6. SIPS and Generalisation.

In teaching, it is important to achieve ecological validity through the use of the regular classroom and school, with instruction by the regular classroom teacher.

Ferretti and Belmont, state:

> ....unlike everyday problems, most tasks used in the laboratory are well defined. They have fixed structures, fixed goals, and well-analyzed solutions. In contrast, many problems in people's everyday environments are embedded in open systems with loosely defined structures and uncertain goals (1983:62).

The above teaching philosophy is consistent with the philosophy of SIPS, for as noted in 2.F.3. Background: The Gow Model-SIPS, the main purpose of SIPS is to provide the learner with a portable and durable strategy to promote generalisation of skills.

Part F. The Meichenbaum Verbal Self-Instruction Technique (VSIT)..

2.F.0. Overview.

This section is set out to present the Meichenbaum Verbal Self-Instruction Technique and discusses its influence on the Gow Self-Instruction Problem Solving Technique.

2.F.1. Background: The Meichenbaum Model-VSIT.

The Verbal Self-Instruction Technique was originally developed by Meichenbaum (see Meichenbaum, 1977). The Meichenbaum model (VSIT) is probably the most widely researched metacognitive strategy (Gow, 1987; Ward & Gow, 1982) and there are a considerable number of studies illustrating its usefulness in training (see Gow, Ward & Balla, 1885). VSIT has been used in many different settings and with a range of different populations (Gow, 1987).

VSIT works on the premise that verbalisations, both covert and overt, cue behaviour. There are five steps involved in the Meichenbaum's model (see Gow, 1987; Gow & Ward, 1985; Gow, Ward & Balla, 1985; Maker, 1981) being:

1) cognitive modelling; the teacher models the task while verbalizing the task aloud,

2) overt external guidance; the child performs the task under the direction of the model,

3) overt self-guidance; the child performs the task whilst instructing himself aloud,

4) faded overt self-guidance; the child whispers the instructions to himself as he completes the task,

5) covert self-instruction; the child completes the task while guiding his performance using private speech.

2.F.2. The Strategies of VSIT

VSIT was designed to control the subject's behaviour by developing the broad strategies of:

1. problem identification,
2. attention control,
3. self reinforcement and self-evaluation,
4. coping skills involving self correction of errors (Gow, 1987).

VSIT requires that instructions relating to performances of the specific task are carefully identified and that appropriate training, through modelling, is provided to ensure that the individual gives him/herself these instructions. Its application to a specific problem or task, follows the above step-by-step sequence of verbalisations, both before and while performing the task.

VSIT also requires the subject to evaluate his or her performance because the verbalisations are first modelled by the instructor, then actively rehearsed by the learner but with the instructor's modelling fading. The various verbal self-directives typically involve questions about the nature of the task (or problem definition), answers to these questions (in the form of cognitive rehearsal to plan what to do next), self instructions that guide through the task and focus attention, coping statements, self reinforcement, and self evaluation (Gow, 1987; Maker, 1981).

2.F.3. Gow, Ward and Balla (1985): An Example of VSIT Research.

Gow, Ward and Balla (1985) researched VSIT dealing with training for adult subjects with an I.Q. range of 40-70. These subjects were trained in three tasks: sandwich making, vacuum cleaning, and collating. Their research adhered to the classic VSIT model and compared VSIT with MODIM (Model/Imitate) with, and without, feedback.

Gow, Ward and Balla (1985) noted that VSIT proved a successful method and well worth further research. In particular, the VSIT groups demonstrated superior short and long term maintenance of training effects. This research showed that moderately to severely mentally retarded adults can be taught self-instructional strategies even though it has been argued that this population is generally language deficient and lacking in self-regulation. In addition, Gow, Ward and Balla note:

> ....VSIT resulted in generalised training effects, leading some support to Brown's (1977) hypothesis that self-instructional training shapes meta-cognitive processes that are trans-situational (1985:125).

This supported the findings of Ackerman and Shapiro (1984) who found that mentally disabled adults could increase productivity and maintain that increase, using self-monitoring exercises without feedback from the instructors. Ackerman and Shapiro (1984) also noted that self-monitoring during the generalisation period assisted generalisation.

Gow, Ward and Balla (1985) also found that VSIT and MODIM are just as effective with no feedback on some tasks. Of similar importance, this research suggested that it is possible to train mentally retarded individuals to be self-regulating and to teach the mentally retarded how to think, and thus train for generalisation.

Part G. The Gow Self-Instruction Problem Solving (SIPS) Technique.

2.G.0. Overview.

Gow has developed a model of instruction which can be seen as a further evolution of the VSIT model. The training procedures are based on verbal self-instruction, with the main purpose being to provide the learner with a portable and durable strategy to promote generalisation of skills. This section presents the Gow Self-Instruction Problem Solving Technique.

2.G.1. Background: The Gow Model-SIPS.

SIPS is consistent with the definition of a cognitive strategy (see Section 1.11.5) and can be viewed as an internally organised set of skills that enables the selection and guidance of the internal processes involved in defining and solving problems. In other words, SIPS trains the learner to apply the skills by means of which s/he manages his/her own thinking behaviour, which in turn affects overt or observable behaviour. Thus, through using the SIPS technique the learner is using cognitive strategies to control his/her individual behaviour (Gow, 1987; Gow, Burton & King, 1988).

2.G.2. The Strategies of SIPS.

Gow (1987) states that to be successful a technique should not only help acquire skills but also generalize and be economical by creating minimal interference to the regular program. SIPS minimizes external reinforcement and feedback and, unlike VSIT, provides a model only when the learner demonstrates either overtly or covertly that he or she cannot proceed with the task.

The SIPS approach requires that learners take responsibility for their own learning (Gow, Burton & King, 1988), with each new task being presented as a "problem" which must be solved with minimal intervention by the instructor. To work out a solution, the learner must self-instruct using two broad types of self-instructions, general and specific (Gow, 1987). A general self-instruction (or process component)- e.g.

"Stop! What am I going to do? How am I going to do it?- serves to focus the attention of the individual on the task. These general self-instructions prompt the specific verbalisations (or substantive components)- e.g."I pick up these two pieces first.."- that are required to guide performance through the task (Gow, 1987).

Gow (1987) sees the general verbalisations as providing the individual with "portable coping strategies" that can be applied effectively to a wide array of problems, contexts and settings. It is from these verbalisations that the components of the program have the potential to promote generalisation. However, research has demonstrated that a combination of general and specific self-instructions is necessary to promote maximum generalisation outcomes (Gow 1987).

Unlike the VSIT model, which imposes the instructor's cognitive-processing style through modelling, Gow's model stresses the need for these verbalisations to be comparable with the cognitive-processing style of the individual learner. Therefore the learner is encouraged to use his or her own language rather than repeat the specific verbalisations given by the model/instructor.

The teaching principles underlying SIPS are simple; to teach "HOW" not "WHY" and, to treat EVERY new situation as a problem using minimum intervention, i.e. to intervene only when learner needs correction, and, to fade instructor input systematically (Gow, 1987).

Gow, Burton and King (1988) give the principles of instruction for teaching the SIPS technique which are similar to Gow's earlier steps for programming for generalisation (see Gow, 1985 in Section 2.E.5). In summary, these latter principles are; intervene only when necessary, select tasks of interest to the learner, minimize external rewards, ensure ecological validity, ensure learner knows what task is about, teach across settings, teach rules or general principles, encourage a problem solving approach, help learner to make the necessary links between tasks, encourage self-monitoring, provide practise, use small groups.

The Gow SIPS model is somewhat revolutionary in its determination to use a minimum of external reinforcement. This philosophy is based on the belief that a desired outcome of any program of instruction should be autonomous behaviour (Gow, 1987).

2.G.3. The Pilot Study for the Research.

In co-operation with Gow, the researcher carried out a pilot study with a group of intellectually disabled primary students and a group of visually impaired high school students (see Appendix 4, Reference Notes 2). The students were initially rated on a 1-5 scale on their ability to organise their problem solving approach. Over a six week time interval, the students were taught the SIPS technique. At the conclusion of the study, the students were re-rated on the 1-5 scale for their ability to organise their problem solving.

The results of this pilot study suggested the need for more research into the use of SIPS with schoolchildren, and in particular, into the use of SIPS with intellectually disabled students.

2.G.4. Summary and Conclusion.

Gow's SIPS approach has evolved from a decade of research (Gow, Burton & King, 1988), and has been trialled with 220 mildly to severely intellectually disabled adolescents and adults (Gow, 1987). SIPS is thought to be more efficient than ABA in terms of generalisation outcomes. It is simple to implement as it requires no sophisticated equipment and finally, can be mastered quickly by instructors (Gow, 1987).

SIPS is consistent with the "new wave" of cognitive theories. SIPS technique seeks to generalize across contexts by training executive processes in teaching the basic principles of thinking and problem solving (Gow, 1987).

However, a study is needed to explore the utility of SIPS within the classroom situation. In the Pilot Study for this research (see Appendix 4, Reference Notes 2) the children were tested on their individual application of SIPS (by means of a metacognitive interview). However, no study has researched the generalisation of skills through acquiring the SIPS technique, that is, the generalisation of knowledge not taught specifically in the SIPS program, but rather on skills taught for use in regular lessons (reading, listening and mathematics). This researcher subscribes to the view that if SIPS promotes generalisation through the organisation of executive skills, then it should be useful more generally in the application of previously acquired knowledge and meta-knowledge in the classroom. This is consistent with current thinking on generalisation as exemplified by Butterfield, who states;

> By definition, transfer tests assess components taught by the program being evaluated, but it is sometimes appropriate to use tests that tap as well knowledge and skills not taught in the program. Sometimes the issue addressed by such tests is whether students integrate knowledge acquired in an educational program with knowledge gained from other life activities. The assumption is that an educational program has limited utility if its curricula produce knowledge that is segregated from the rest of a person's knowledge (1987:6,7).

Research is required into the use of SIPS with schoolchildren. Such research should teach the SIPS technique: within the regular classroom (as opposed to a laboratory), by the regular class teacher (as opposed to an unknown researcher), and, in conjunction with the regular curriculum (as opposed to meaningless letter-sequencing laboratory tasks).

CHAPTER 3

METHODOLOGY

3.0. Research Overview.

This research will:

[A] compare the experimental group of primary-aged mildly intellectually disabled schoolchildren to the control group of primary-aged mildly intellectually disabled schoolchildren ,

[B] compare the experimental group of secondary-aged mildly intellectually disabled schoolchildren to the control group of secondary-aged mildly intellectually disabled schoolchildren,

[C] compare the two experimental groups of mildly intellectually disabled schoolchildren, that is, explore any differences in outcome from the application of the Independent Variable (i.e. the SIPS program) between primary-aged and secondary-aged students.

In this research I have endeavoured to approach a true experimental design by incorporating the essential pre-test/post-test, with control, within each of the primary and secondary groups (Cohen & Manion, 1985).

However, this research recognizes that the random selection and assignment of classrooms and schools, as well as the random selection of subjects within available schools and classrooms are impracticable. Not the least of the problems is that there exists only a very limited number of O.A. classes. Therefore, the research design is quasi-experimental (see Cohen & Manion, 1985). This recognizes the fact that the O.A. students within the classes selected for this research may not be matched other than as primary-aged or secondary-aged. Similarly, the teachers in the selected classrooms may not be matched other than as primary appointed O.A. teachers or as secondary appointed O.A. teachers. However, it should be noted that all teachers in this study have completed some Special Education training.

The method of data analysis selected for this research should enable an adjustment of the results of the experiment to allow for pre-existing differences among subjects (see 3.6 Data Analysis).

3.1. Variables.

As noted in section 1.8, the variables for this research are:

3.1.1. Independent Variable.

The implementation, by the regular classroom teacher, of the program for Self Instruction Problem Solving.

3.1.2. Dependent Variables.

The scores obtained by the subjects in their pre-test and post-tests for each of the following:

rating in basic problem solving techniques, reading rate, reading accuracy, reading comprehension, aural comprehension, and, practical mathematics (see 3.5 Data Components).

3.2. Research Questions.

This research asks three questions of each of the six tests below.

It was decided to use directional research questions and directional hypotheses (see Table 3.2) for questions [A] and [B]. This decision was made in view of the results of the Pilot Study (see Appendix 4) which indicated that SIPS would result in some improvement (or at worst, no improvement). There was no reason to consider a detrimental effect from SIPS. In view of this decision a 1-tail test was applied to these questions.

However the nature of question [C] required a non-directional question and non-directional hypothesis (see Table 3.2) and therefore a 2-tailed test was applied to this question.

3.2.1. Test 1: Rating in Basic Problem Solving Techniques.

[A] Is there any significant improvement to the basic problem solving techniques of primary-aged mildly intellectually disabled schoolchildren following a six week course in SIPS ?

[B] Is there any significant improvement to the basic problem solving techniques of secondary-aged mildly intellectually disabled schoolchildren following a six week course in SIPS ?

[C] Is there any significant difference between the results of [A] and [B] for basic problem solving techniques; that is, is there any difference in the outcomes from the application of the Independent Variable between primary-aged and secondary-aged students ?

3.2.2. Test 2: Reading Rate.

[A] Is there any significant improvement to the reading rate of primary-aged mildly intellectually disabled schoolchildren following a six week course in SIPS ?

[B] Is there any significant improvement to the reading rate of secondary-aged mildly intellectually disabled schoolchildren following a six week course in SIPS ?

[C] Is there any significant difference between the results of [A] and [B] for reading rate; that is, is there any difference in the outcomes from the application of the Independent

Variable between primary-aged and secondary-aged students ?

3.2.3. Test 3: Reading Accuracy.

[A] Is there any significant improvement to the reading accuracy of primary-aged mildly intellectually disabled schoolchildren following a six week course in SIPS ?

[B] Is there any significant improvement to the reading accuracy of secondary-aged mildly intellectually disabled schoolchildren following a six week course in SIPS ?

[C] Is there any significant difference between the results of [A] and [B] for reading accuracy; that is, is there any difference in the outcomes from the application of the Independent Variable between primary-aged and secondary-aged students ?

3.2.4. Test 4: Reading Comprehension.

[A] Is there any significant improvement to the reading comprehension of primary-aged mildly intellectually disabled schoolchildren following a six week course in SIPS ?

[B] Is there any significant improvement to the reading comprehension of secondary-aged mildly intellectually disabled schoolchildren following a six week course in SIPS ?

[C] Is there any significant difference between the results of [A] and [B] for reading comprehension; that is, is there any difference in the outcomes from the application of the Independent Variable between primary-aged and secondary-aged students ?

3.2.5. Test 5: Aural Comprehension.

[A] Is there any significant improvement to the aural comprehension of primary-aged mildly intellectually disabled schoolchildren following a six week course in SIPS ?

[B] Is there any significant improvement to the aural comprehension of secondary-aged mildly intellectually disabled schoolchildren following a six week course in SIPS ?

[C] Is there any significant difference between the results of [A] and [B] for aural comprehension; that is, is there any difference in the outcomes from the application of the Independent Variable between primary-aged and secondary-aged students ?

3.2.6. Test 6: Basic Mathematics.

[A] Is there any significant improvement to the basic mathematics of primary-aged mildly intellectually disabled schoolchildren following a six week course in SIPS ?

[B] Is there any significant improvement to the basic mathematics of secondary-aged mildly intellectually disabled schoolchildren following a six week course in SIPS ?

[C] Is there any significant difference between the results of [A] and [B] for basic mathematics; that is, is there any difference between the outcomes from the application of the Independent Variable between primary-aged and secondary-aged students ?

3.3. Research Design.

As noted above (see 3.0 Research Overview), while I have endeavoured to approach a true experimental design, the actual design of this research is quasi-experimental, hence the dashed lines in the following table (see Cohen & Manion, 1985:193). Graphically, the design for each of the six tests (see 3.2.1-3.2.6) remains constant, and is represented thus:

TABLE 3.1. RESEARCH DESIGN.

PRIMARY	O_1	X_1	O_2

	O_3		O_4
SECONDARY	O_5	X_2	O_6

	O_7		O_8

X represents the exposure of the group to the independent variable, the program in SIPS.
O represents the pre-test and post-test observations with left to right order indicating temporal sequence.
X's and O's in same line apply to same persons.
X's and O's vertical to one another are simultaneous.
Dashed line separating the groups notes groups not equated by random assignment.

3.4. Statistical Hypotheses and Format of Results.

To avoid repetition of format, the statistical hypothesis and format of results are presented in Table 3.2.

Table 3.2. Statistical Hypotheses and Format of Results.

Statistical Hypotheses	Format of Results
3.4.1. Test 1: Rating in Basic Problem Solving Techniques.	
[A] H_0: $U_2 < U_4$	No significant improvement ($p > 0.05$; 1-tailed test).
H_A: $U_2 > U_4$	There is a significant improvement ($p < 0.05$; 1-tailed test).
[B] H_0: $U_6 < U_8$	No significant improvement ($p > 0.05$; 1-tailed test).
H_A: $U_6 > U_8$	There is a significant improvement ($p < 0.05$; 1-tailed test).
[C] H_0: $U_2 = U_6$	No significant difference ($p > 0.05$; 2-tailed test).
H_A: U_2 £ U_6	There is a significant difference ($p < 0.05$; 2-tailed test).

3.4.2. Test 2: Reading Rate.

[A] H_0: $U_2 < U_4$ No significant improvement ($p > 0.05$; 1-tailed test).
H_A: $U_2 > U_4$ There is a significant improvement ($p < 0.05$; 1-tailed test).
[B] H_0: $U_6 < U_8$ No significant improvement ($p > 0.05$; 1-tailed test).
H_A: $U_6 > U_8$ There is a significant improvement ($p < 0.05$; 1-tailed test).
[C] H_0: $U_2 = U_6$ No significant difference ($p > 0.05$; 2-tailed test).
H_A: U_2 £ U_6 There is a significant difference ($p < 0.05$; 2-tailed test).

3.4.3. Test 3: Reading Accuracy.

[A] H_0: $U_2 < U_4$ No significant improvement ($p > 0.05$; 1-tailed test).
H_A: $U_2 > U_4$ There is a significant improvement ($p < 0.05$; 1-tailed test).
[B] H_0: $U_6 < U_8$ No significant improvement ($p > 0.05$; 1-tailed test).
H_A: $U_6 > U_8$ There is a significant improvement ($p < 0.05$; 1-tailed test).
[C] H_0: $U_2 = U_6$ No significant difference ($p > 0.05$; 2-tailed test).
H_A: U_2 £ U_6 There is a significant difference ($p < 0.05$; 2-tailed test).

3.4.4. Test 4: Reading Comprehension.

[A] H_0: $U_2 < U_4$ No significant improvement ($p > 0.05$; 1-tailed test).
H_A: $U_2 > U_4$ There is a significant improvement ($p < 0.05$; 1-tailed test).
[B] H_0: $U_6 < U_8$ No significant improvement ($p > 0.05$; 1-tailed test).
H_A: $U_6 > U_8$ There is a significant improvement ($p < 0.05$; 1-tailed test).
[C] H_0: $U_2 = U_6$ No significant difference ($p > 0.05$; 2-tailed test).
H_A: U_2 £ U_6 There is a significant difference ($p < 0.05$; 2-tailed test).

3.4.5. Test 5: Aural Comprehension.

[A] H_0: $U_2 < U_4$ No significant improvement ($p > 0.05$; 1-tailed test).
H_A: $U_2 > U_4$ There is a significant improvement ($p < 0.05$; 1-tailed test).
[B] H_0: $U_6 < U_8$ No significant improvement ($p > 0.05$; 1-tailed test).
H_A: $U_6 > U_8$ There is a significant improvement ($p < 0.05$; 1-tailed test).
[C] H_0: $U_2 = U_6$ No significant difference ($p > 0.05$; 2-tailed test).
H_A: U_2 £ U_6 There is a significant difference ($p < 0.05$; 2-tailed test).

3.4.6. Test 6: Basic Mathematics.

[A] H_0: $U_2 < U_4$ No significant improvement ($p > 0.05$; 1-tailed test).
H_A: $U_2 > U_4$ There is a significant improvement ($p < 0.05$; 1-tailed test).
[B] H_0: $U_6 < U_8$ No significant improvement ($p > 0.05$; 1-tailed test).
H_A: $U_6 > U_8$ There is a significant improvement ($p < 0.05$; 1-tailed test).
[C] H_0: $U_2 = U_6$ No significant difference ($p > 0.05$; 2-tailed test).
H_A: U_2 £ U_6 There is a significant difference ($p < 0.05$; 2-tailed test).

[A] Comparison of primary-aged groups.
[B] Comparison of secondary-aged groups.
[C] Comparison of the two experimental groups.
H_0 Null Hypothesis.
H_A Alternate Hypothesis.
U_2, U_6: F-score observed.
U_4, U_8: F-score required.

3.5. Data Components.

The following tests were given by the researcher:

Test 1: Rating in Basic Problem Solving Techniques.

Students were rated on a one to five scale for their individual basic problem solving techniques following a metacognitive interview.

1.= no idea of what he/she was supposed to be doing.
2.= knew what he/she was supposed to be doing but had no idea how he/she was going to do it.
3.= fair idea of what but a vague idea only of how.
4.= good idea of what and a fair idea of how but not able to execute plan.
5.= good idea of both what and how and able to execute the plan.

During the implementation of the program, the individual students' scores were rated as often as desired by the teacher and students, as this has been demonstrated to give the students motivation (see Pilot Study, Appendix 4). However, for data analysis, only the pre-test and post-test scores were used.

During the metacognitive interview, the researcher asked the student to, "describe carefully what you would do if I asked you to cook a cake", followed by another request, "describe carefully what you would do if I asked you to clean out that cupboard". The reactions of the students were rated on the above scale by following these guidelines:

1.= blank looks.
2.= confused type of answer, such as "get cream", "clean it".
3.= repeating of the request without describing how (e.g. "How would I bake a cake? I'd bake it in the oven", or, "How would I clean out that cupboard? I'd just clean it").
4.= describe in a haphazard order plans that would have to be revised to allow execution (e.g. "I'd get the utensils, I'd turn on the oven, I'd get the flour (cake mix), I'd wash my hands", and, "I'd get the things out, I'd open the door, I'd find a cloth to wipe out everything").
5.= describe in correct order the actions required to complete the tasks. These plans, if followed, would allow for the task to be completed.

Tests 2-4: Reading Rate, Accuracy and Comprehension.

Each student was given The Neale Analysis of Reading Ability Test C and ranked in Rate, Accuracy and Comprehension.

Post-testing for reading was assessed through the alternate Test B for the Neale Analysis to minimize practice effect bias.

The Neale Analysis of Reading Ability was chosen because of its reliability and validity (validity coefficient =0.95). This test has a proven reliability in keeping with tests like the Vernon Word Reading Test and new Revised Stanford-Binet Intelligence Test. Between the alternate tests, a correlation between 0.96 and 0.98 for accuracy, and, between 0.92 and 0.98 for comprehension has been demonstrated (Neale, 1970).

Test 5: Aural Comprehension.

When subjects reached their limits on the Neale reading test, the researcher read aloud the failed reading passage and comprehension questions. This was followed by the two consecutive reading passages. Comprehension scores only of these readings were noted. Because it was expected that the children, in reflection of their different reading abilities, would answer a different number of actual questions over three passages (20 or 24 questions), and indeed because a few better readers would exhaust the passages before completing three aural examples (answering only 16 or 8 questions), the raw score was equated to a standardized score for consistency of analysis (e.g. 4/16=16/24, 13/20=15.6/24, 5/8=15/24).

Test 6: Basic Mathematics.

Each student was given a number test. This test was based on an every-day teacher-made class test. This test is designed to assess a student's understanding of measurement and money. To assist in the more difficult calculations of the problems in written form, students were expected to use calculators for their devised algorithms. In view of the expected poor reading of the student, the classes were given this test on a group basis and the researcher read each question aloud (as many times as necessary) to ensure that it was mathematical reasoning, and not reading ability, that was being tested. The individual raw scores for this test was recorded.

The post-test was presented in a slightly redesigned form of the original to help reduce practice bias (see Appendix 5.3a, 5.3b).

3.6. Data Analysis.

The subjects in this research have all been categorized as O.A. students by the Department of Education. However, it is apparent that there is still a large variety of individual student idiosyncrasies. Because the subjects in this research may not be matched other than by being O.A. primary-aged or O.A. secondary-aged, it was anticipated that there would be initial differences between groups on pre-test criteria. Because this research measured change over a given period of time via a pre-test/ post-test design, the selection of a data analysis strategy was influenced by the need to provide an adjustment of the results of the experiment for differences existing before the start of the experiment.

The data gathered for this research was therefore examined through analysis of covariance, as the primary purpose of the analysis of covariance is to provide such an adjustment (Isaac & Michael, 1977; Keppel, 1973).

3.7. Pilot Study.

This study has been piloted (see Appendix 4). The pilot study revealed that there was reason to believe that SIPS facilitated generalisation of skills in the primary-aged O.A. student and suggested a need for further study in this field.

3.8. Selection of Subjects.

This research set out to study two distinct age-groups of mildly intellectually disabled students; primary-aged and secondary-aged. The participating schools were selected from the South Coast Region of New South Wales. The participating classes were selected from Albion Park Rail Primary School O.A. class (the researcher's own class), Fairy Meadow Demonstration Primary School O.A. class, Kanahooka High School O.A. class (excepting seventh grade), and Oak Flats High School O.A. class (excepting seventh grade). Due to the usual overlap of ages between the sixth and seventh grades the exception of grade seven students was thought necessary to distinguish further between the primary-aged and secondary-aged groupings.

3.9. Implementation.

At the conclusion of the pre-testing of all subjects, the teacher of the high school experimental group was taught the SIPS model by the researcher, (i.e. by the teacher of the primary control group), and given a copy of the Classroom Teacher's Program for Self Instruction Problem Solving Technique (see Appendix 2).

The program was run for six weeks and implemented in a variety of modes and lesson activities as set out in the Classroom Teacher's Program for Self Instruction Problem Solving Technique).

Implementation of this program is, as the literature and the outline below show, a very simple procedure. Teaching the SIPS problem solving technique is programmed into the regular General Life Orientation Skills section of the O.A. program and used in all other sections of the O.A. program (basic academic, health, recreational/leisure skills) (see Chapter 2 Part A). Indeed, as the program progresses, the students are encouraged to use the technique in every situation that poses a problem as exemplified in the following:

1) "What am I doing?"... "I am doing a subtraction algorithm. I need to regroup the tens".... "What do I need?".. "M.A.B";

2) "What am I doing?"..."Making soup"....."What do I need?.. "saucepan, soup mix, water, stove plugged into wall and hot plate on".

3.10. Documentation- Classroom Procedure.

The Class Teacher's Program for Self Instruction Problem Solving (see Appendix 2) was documented to facilitate research approval by the Department of Education and acceptance by the Principals of the selected schools. Copies of this documentation were designed to be placed directly into the class teacher's existing program.

During the six weeks of programmed SIPS the following chart was displayed:

PROBLEM SOLVING

Step 1. What am I doing?
What do I need?
2. Decide, and make your plan to reach that goal
3. Can I follow this plan?
(Yes? Go to 4)
(No? Go to 2)
4. Do it NOW*
5. Is the plan working?
(Yes? Go to 6)
(No? Go to 1)
6. Can I make it better?
(Yes? Return to step 1)
(No? Good, you're done)

3.11. Documentation-Department of Education.

Department of Education approval for research in State Schools was granted to this study following the appropriate and adequate documentation being forwarded to the relevant authorities (see Appendix 6).

Chapter 4

Results and Discussion

4.0. Overview.

In this fourth chapter the results of the research will be tabled. Data in this study have been examined through Analysis of Covariance. Significance has been set at p=0.05 to reflect the quality of this experiment. Table 4.1 will report the f-score, the acceptance or rejection of the null hypothesis (see 3.4.1-3.4.6), and the consequent interpretation based on the research questions (see 3.2.1-3.2.6). Following Table 4.1 there will be a discussion of these results. This will be followed by a general discussion on the implications of the results. Summary tables of the statistical findings have been included in the appendix (see Appendix 8).

4.1. Results.

The results of this research have been presented in Table 4.1 below.

Table 4.1. Table of Results

TEST	SIGNIF. of F.	NULL	INTERPRETATION
BPST [A]	0.009	Reject	There is a significant improvement in basic problem solving techniques by primary-aged mildly intellectually disabled schoolchildren following a six week course in SIPS.
BPST [B]	0.067	Accept	No significant improvement in basic problem

			solving techniques following a six week course in SIPS by secondary-aged Mildly Intellectually Disabled schoolchildren.
BPST [C]	0.776	Accept	No significant difference in the results of [A] and [B], to basic problem solving techniques following a six week course in SIPS, that is, there is no difference in the application of the Independent Variable between primary-aged and secondary-aged students.
RRate [A]	0.325	Accept	No significant improvement in reading rate by primary-aged mildly intellectually disabled schoolchildren following a six week course in SIPS.
RRate [B]	0.687	Accept	No significant improvement in reading rate by secondary-aged mildly intellectually disabled schoolchildren following a six week course in SIPS.
RRate [C]	0.182	Accept	No significant difference in the results of [A] and [B], for reading rate, following a six week course in SIPS, that is, there is no difference in the application of the Independent Variable between primary-aged and secondary-aged students.
RAcc [A]	0.090	Accept	No significant improvement in reading accuracy by primary-aged mildly intellectually disabled schoolchildren following a six week course in SIPS.
RAcc [B]	0.543	Accept	No significant improvement in reading accuracy by secondary-aged mildly intellectually disabled schoolchildren following a six week course in SIPS.
RAcc [C]	0.440	Accept	No significant difference in the results of [A] and [B], for reading accuracy,

			following a six week course in SIPS, that is, there is no difference in the application of the Independent Variable between primary-aged and secondary-aged students.
RComp [A]	0.272	Accept	No significant improvement in reading comprehension by primary-aged mildly intellectually disabled schoolchildren following a six week course in SIPS.
RComp [B]	0.015	Reject	There is a significant improvement in reading comprehension by secondary-aged mildly intellectually disabled schoolchildren following a six week course in SIPS.
RComp [C]	0.332	Accept	No significant difference in the results of [A] and [B], for reading comprehension, following a six week course in SIPS, that is, there is no difference in the application of the Independent Variable between primary-aged and secondary-aged students.
AComp [A]	0.861	Accept	No significant improvement in aural comprehension by primary-aged mildly intellectually disabled schoolchildren following a six week course in SIPS.
AComp [B]	0.850	Accept	No significant improvement in aural comprehension by secondary-aged mildly intellectually disabled schoolchildren following a six week course in SIPS.
AComp [C]	0.312	Accept	No significant difference in the results of [A] and [B] for aural comprehension, following a six week course in SIPS, that is, there is no difference in the application of the Independent Variable between primary-aged and secondary-aged students.
Maths [A]	0.010	Reject	There is a significant

			improvement in basic mathematics by primary-aged mildly intellectually disabled schoolchildren following a six week course in SIPS.
Maths [B]	0.793	Accept	No significant improvement in basic mathematics by secondary-aged mildly intellectually disabled schoolchildren following a six week course in SIPS.
Maths [C]	0.351	Accept	No significant difference in the results of [A] and [B], for basic mathematics, following a six week course in SIPS, that is, there is no difference in the application of the Independent Variable between primary-aged and secondary-aged students.

4.2. Discussion: The Application of the Independent Variable.

It is of great interest that there is no difference in the results of primary-aged and secondary-aged O.A. schoolchildren in their application of the Independent Variable. Maker (1981) warned that it is important to consider the "age and maturity of the children involved" (p.138) in a cognitive modification approach, as she felt the literature revealed that "overt self-instruction may interfere with the performance of older or high IQ children" (p.138). With respect to the actual learning of, and implementing a technique involving overt self-instruction, there is no difference between primary-aged and secondary-aged O.A. schoolchildren. Whether this is a reflection of the amount of overt self-instruction needed by a student before s/he moves to the covert level, or whether it is a reflection of a relationship between I.Q. and maturity (despite chronological age), it is not within the scope of this research to hypothesize. It is possible that the six weeks time limit for the running of the program in SIPS is insufficient to reveal any difference between the results of primary-aged and secondary-aged O.A. schoolchildren, in which case subsequent studies are needed to test SIPS programming effects over a longer time period. The claim that there is no difference between primary-aged and secondary-aged O.A. schoolchildren in their application of SIPS, is of special interest to the teacher, as it supports the earlier statement (see 1.0. Background to the Problem) that the SIPS model appears to be very convenient for teachers to program.

As noted in 1.0 Background to the Problem, there is ample evidence to suggest that intellectually disabled people do <u>not</u> use active strategies. However, this research has shown that it is possible to teach primary-aged O.A. schoolchildren an active learning strategy. This research demonstrated a significant improvement amongst primary-aged O.A. schoolchildren in basic problem solving techniques following a six week course in SIPS.

This finding, which is possibly the single most important finding in this study, must generate more research into the teaching of active strategies to the learning disabled. While the same does not appear to be the case for secondary-aged schoolchildren, it is worth noting the result (f=0.067) in the basic problem solving experiment with secondary-aged O.A. schoolchildren. This result cannot be dismissed. Such a result may well be an effect of the attendant risks of a small sample. The result is interesting in that it almost reaches significants, and therefore at the very least, supports the need for further research.

4.3. Discussion: Generalisation to Subject Domains.

Having established:

1. there is no difference in the application of SIPS between primary-aged and secondary-aged schoolchildren,
2. primary-aged (and possibly secondary-aged) O.A. students are able to learn and use SIPS,

it is sensible to address the part of the experiment that test for generalisation of problem solving skills to subject domains.

In this research no evidence was found to suggest that either primary-aged or secondary-aged O.A.

students were generalizing this newly learnt skill to subject domains with consistency.

The results for the experiments with reading comprehension and mathematics are very interesting. For reading comprehension, the experiment with secondary-aged O.A. schoolchildren demonstrated an improvement with a very high level of significance (p=0.015). Similarly, for mathematics, the experiment with primary-aged O.A. schoolchildren demonstrated an improvement with a very high level of significance (f=0.010). However there was an apparent failure of primary-aged O.A. schoolchildren to demonstrate a significant improvement in reading comprehension,and similarly for secondary-aged O.A. schoolchildren to demonstrate a significant improvement in mathematics. Whether this is a reflection of age, the nature of the task, or, the risk attatching to a small sample size, cannot be judged here. However, results demonstrating improvement at such high levels of significance most certainly indicate that there is reason to teach O.A. schoolchildren SIPS.

The results for the experiments with reading rate and aural comprehension reveal that there was no significant improvement in either the primary-aged or secondary-aged groups. Again, whether such results are due to the nature of the tasks, or to the nature of

O.A. students in general, cannot be judged here. However, this result does suggest there is need for further research into the relationship between the reading rate of the grapheme and the comprehension of the phoneme.

However, the results for the experiment with <u>reading accuracy</u>, whilst they have led to the acceptance of the null hypothesis for both the primary-aged and secondary-aged groups, are not totally consistent with those of reading rate and aural comprehension. In the <u>reading accuracy</u> experiment with primary-aged schoolchildren, the significance of f=0.090 is worth noting. Once again, such a result may well reflect the risk attending to a small sample. If such is the case, then this result cannot be overlooked. Reading accuracy is so important a skill, that this result indicates the need for further research, (infact further research may well be essential!).

4.4. Implications of the Results.

This research has demonstrated that SIPS can be implemented and will promote generalisation, but inconsistently. In fact, one could claim that SIPS will be used by some of the people some of the time!

This research has supported the conclusions of Borkowski and Kurtz (1984) which state that mentally retarded and impulsive children might receive a special boost from metacognitive training because learning failures may well be attributed to failures to implement appropriate task strategies rather than simple memory deficits. Furthermore, Borkowski's (1985) hypothesize that learning disabled children could merely lack the knowledge of "when, how and why" (p.124) to use a strategy has been sustained. At the conception of this research it was decided to accept the risk attending to a small sample size. There is little doubt that with a larger sample would come a greater consistency in results. Similarly, there is little doubt that had the program for the training of SIPS been implemented over a longer time, then a more consistent result may have been achieved.

The findings therefore do have a profound implication on the O.A. curriculum, for this research has demonstrated that it is possible to teach for generalisation of skills from one situation to another. Specifically it has demonstrated that the use of SIPS does enhance problem solving skills in some situations (see 1.6. Substantive Assumption).

The purpose of this study (see 1.2. Purpose of the Study) was to examine the application and effectiveness of the SIPS model. This is consistent with a more global view of educational research, being:

> (1) to generate knowledge to advance the effectiveness and quality of educational systems, (2) to be used by professional educators for this end, and (3) to reduce the costs of the educational system if effectiveness can be maintained or improved while doing so (Asher, 1976:12).

Within its obvious limitations the present study appears to have achieved these aims to a reasonable degree.

CHAPTER 5

Summary and Conclusions.

5.0. Overview.

This final chapter will summarize this research. Following the summary there will be a discussion of this research in the light of the current literature. Conclusions arising from this research will be stated.

5.1. Summary of the Research.

This research set out to examine the application and effectiveness of the Self-Instruction Problem Solving Technique with O.A. primary and O.A. secondary schoolchildren. The SIPS program was implemented by their regular teacher, within their normal classroom situation.

This research attempted to approach a true experimental design by incorporating a pre-test and a post-test, with control, for each of the primary and secondary groups. The method of data analysis was selected to provide an adjustment of the results of the experiment for differences existing among the subjects before the start of the experiment, and the researcher accepted the risks attending to a small sample.

Specifically, this research examined the utility of SIPS to enhance generalisation of problem solving skills across the subject domains of reading (reading rate, accuracy and comprehension), listening (aural comprehension) and basic mathematics. Furthermore, the results of the primary-aged students and those of the secondary-aged students were examined for differences.

The results of the experiments demonstrated that SIPS will enhance generalisation of problem solving skills to subject domains for some students some of the time. Further research will be needed to resolve the fine detail of the inconsistancies embedded in these results; however, this research has clearly demonstrated that enhancement of generalisation is fundamentally possible through SIPS. The results further demonstrated that there is no significant difference between the primary O.A. and secondary O.A. student in their application of the SIPS program.

5.2. Discussion: The Findings of This Research and the Current Literature.

The pilot study for this research (see Appendix 4, Reference Notes 2) suggested the need for further investigation of SIPS with intellectually disabled schoolchildren. The findings of this research have proven the suggestion was justified. The pilot showed that the SIPS technique could be taught to primary O.A. students and demonstrated by an improvement in their problem solving. This research has shown that the use of SIPS is demonstrated not only in a significant improvement to some students' basic problem solving technique, but also in the facilitation of generalisation of skills to other subject domains.

Butterfield and Ferretti (1985) specifically note that intellectually disabled people "have less metacognitive understanding of their own cognitive systems", and "use less complete and flexible executive processes" (p.3) (see 2.D.1 Background: The Intellectually Disabled). However, this research has suggested that by using SIPS, the learner is applying an internally organized set of skills (see 2.G.1. Background: The Gow Model-SIPS) thereby enhancing a better use of executive processes, demonstrated through the facilitation of generalisation. This finding is consistent with the recent claim that the central theme underlying the principles of SIPS is that a student is taught "how to learn" (Gow, Burton & King, 1988:19, researcher's emphasis). Gow, Burton and King state:

> The main purpose of SIPS is to promote adaptive use of knowledge by providing the learner with a portable and durable strategy for approaching "problems" (1988:18).

In view of the Department of Education's policy on integration (see Section 2.B.1.) and the findings that SIPS promotes generalisation of skills (in some cases), the teaching of the SIPS technique within regular classrooms should be investigated. There is no reason to suspect that the SIPS program undertaken by O.A. students within an integrated classroom would differ in effectiveness from the SIPS program undertaken by O.A. students within a segregated classroom. A further motivation for teachers to program SIPS has been the support of this research for the claim that SIPS is easy to program and implement in the classroom situation (see Section 4.2. Discussion: Application of the Independent Variable).

In 1983, the then Director-General of Education (Swan) stated that it was "essential....(that O.A. students).... develop self-awareness ....(p.1). The SIPS program, in teaching a cognitive strategy that teaches a student "how to learn" (Gow, Burton & King, 1988:19) must be considered to be developing "self-awareness". By teaching a strategy such as SIPS, the pedagogue is effectively improving metacognitive understanding, that is, the individual student's information about his/her self as a thinker and his/her own base knowledge and strategic repertoire (Butterfield & Ferretti, 1985). There seems little doubt that there is a place for the teaching of SIPS to intellectually disabled students.

Generalisation is an important but neglected area of learning and development (Gow, 1985; Ward & Gow, 1982). This research has demonstrated by significantly improved test results in some subject domains, that generalisation is facilitated through the teaching of the SIPS cognitive strategy. Although there is still a dearth of research, it is hoped that this study has enhanced knowledge in the field.

Whilst it is apparent that further research of SIPS must be undertaken in the field of intellectually disabled students, it is of interest that the developer of this technique is presently assessing the viability of SIPS with two other distinct population categories: gifted, and behaviourally disordered children (Gow, Burton & King, 1988). Despite the findings of Doherty (1982) which separately categorized leaning disabled and behaviourally disabled, Section 2.A.4. A Further Literature Search for Definition of O.A. has noted Heward and Orlansky's (1980) claim that many more behaviourally disordered than normal children score within the intellectually disabled range on I.Q. tests. Therefore this research has implications for those involved with strategy training and behaviour (see Borkowski & Kurtz, 1984; Cross, 1976; Wragg, 1987) by suggesting that SIPS may also prove a successful technique in modifying the behaviour of the behaviourally disabled.

This research has demonstrated that SIPS will enhance generalisation of problem solving skills to subject domains (in some cases) and thereby has shown that SIPS, when used by primary and secondary mildly intellectually disabled students will promote adaptive use of knowledge. In view of the ample evidence to suggest that intellectually disabled people do not use active strategies (see 1.0. Background to the Problem and 2.D.1. Background: The Intellectually Disabled), this finding should not be overlooked by those who develop curricula within the Department Of Education, lest criticism such as that of Cohen and Manion has yet another example:

> A characteristic of education in the western world has been its fitful and uneven progress. This has been attributed in the main to .... (a) ....reluctance to apply the principles of research...to educational issues (1985:5).

5.3. Conclusions.

Gow's Self-Instruction Problem Solving Technique has evolved from a decade of research into cognitive learning strategies, most notably the Meichenbaum Verbal Self-Instruction Technique. However, while SIPS has previously proved successful when trialled with 220 mildly to severely intellectually disabled adolescents and adults (Gow,1987), to date, there has been a dearth of research with the school-aged population. Therefore, the results of this research extend the existing knowledge and support the claims that SIPS enhances generalisation.

In terms of economy in implementation, SIPS proved easy to program, requiring no sophisticated equipment or specialized expertise by the regular classroom teacher. Furthermore, the implementation of the SIPS program required little or no external reinforcement.

The findings of this research do have a profound implication on the O.A. curriculum , for in finding that it is possible to teach for generalisation of skills from one situation to another, it therefore suggests that such programs are necessary to enhance the learning of the intellectually disabled schoolchild.

APPENDICES

APPENDIX I

A GENERAL GUIDE TO SELF-MANAGEMENT (HOW TO SOLVE A PROBLEM) -a 6-step flow diagram.

(1) Decide on a goal.
(2) Make a plan to reach the goal.
(3) Try the plan.
(4) Ask: Did the plan work?
    Yes-Good you're done
    No- go to (5)
(5) Ask: Did I actually follow the plan?
    No- Go to (3)
    Yes- Go to (6)
(6) Ask: What went wrong with the plan?
    Go to (2)

(Belmont, Butterfield & Ferretti, 1982:151)

APPENDIX 2.

APPENDIX 2

Class Teacher's Program for Self-Instruction Problem Solving

Long Term Goals

1. To develop the skills necessary for generalisation of knowledge across subject domains.

2. To develop the Executive Cognitive Systems (i.e. the ability to organize the cognitive processes to facilitate problem solving.

Rational

Self-Instruction Problem Solving (SIPS) has evolved from a decade of research and development of cognitive and metacognitive theory, most notably the Verbal Self-Instruction Technique (VSIT). SIPS offers a less structured approach to training in which the individuals' cognitive style is allowed to develop, free of strong modelling from the instructor and hence, free of the imposition of another's cognitive style. If education is to be in reality, preparation for life, then problem solving must be applicable to the everyday environments of open systems. Research with adult intellectually disabled has suggested that SIPS offers a greater transferability or generalisation of skills.

Research has found that learning disabled students are less proficient than normally achieving students in every step and level of proficiency and infact 40% of the learning disabled group's responses consisted of random or impulsive answers without any relationship to the problem requirements. Learning disabled students have few attack strategies to apply to problem solution and those who possess some strategies do not use them effectively.

It can be thus summerized that students with learning disabilities;

-lack learning strategies

-lack independence/self)learning skills;

-tend to be passive learners

-have less verbal control of non-verbal behavior than their non-disabled peers; and

-do not attend to the relevant aspects of stimuli.

The SIPS approach requires that learners take responsibility for their own learning with each new task being presented as a "problem" which must be solved by the learner with minimal intervention by the instructor. To work out a solution, the learner self-instructs using two broad types of self-instructions: general and specific. A general self-instruction (or process component)- e.g. "Stop! What am I going to do? How am I going to do it?- serves to focus the attention of the individual on the task.

These general self-instructions prompt the specific verbalisations (or substantive components)- e.g."I pick up these two pieces first..")- which are required to guide performance through the task.

The SIPS model sees the general verbalisations as providing the individual with "Portable coping strategies" which can be applied effectively to a wide array of problems contexts and settings. It is from these verbalisations, therefore, that potentially, the components of the program promote generalisation.

Aims

1. At the completion of this six week course in Self Instruction Problem Solving the student should demonstrate, both overtly (by verbalisations) and covertly (by "organised behaviour), that he/she is using the SIPS approach in a variety of situations.

2. At the completion of this six week course in Self Instruction Problem Solving the student should demonstrate, by means of pre and post-program testing that he/she has generalised skills from one curriculum area into another.

Method

The SIPS approach will be introduced in a general problem area, and, over the six week course will gradually become used more and more to specific problems. Eventually the student can be expected to be using SIPS for every new problem, no matter how mundane, or alternately, how subject-specific.

To baseline the students' pre-SIPS training ability, the following tests will be used and given by the researcher:

1. Each student rated 1-5 on a Basic Problem Solving technique scale.

   1.=no idea of what he/she was supposed to be doing
   2.=knew what he/she was supposed to be doing but had no idea how he/she was going to do it
   3.=fair idea of what but a vague idea only of how
   4.=good idea of what and a fair idea of how but not able to execute plan
   5.=good idea of both what and how and able to execute the plan.

2. Each student given The Neale Analysis of Reading Ability and ranked in Rate, Accuracy and Comprehension.

3. Following inability to continue the Neale test, the researcher will read the failed reading and the two consecutive readings. Comprehension of these readings only will be scored and these will not be ranked in any way other than to note the raw score (e.g. 6/12).

4. Each student will be given a simple number test for measurement and money. In view of the expected poor reading of the student, the classes will ba given this test on a group basis and the researcher will read each question to ensure that it is mathematics, and not reading ability, that is being tested. As for the aural comprehension, raw score only for this test will be noted.

Introduction to the SIPS technique to be implemented in a whole of class situation, beginning with asking students-

"What do you do when you are faced with a problem such as finding your clothes for school in the morning?"

From this very general problem area gradually move to the more specific area-

"What do you do when faced with the problem of getting your things ready to begin a days work at school?"

From these general problem areas, teacher is to elicit the response something to the effect-

"We must stop and think what it is we are doing".

This lesson is to be concluded with the displaying of the following chart (which is to remain on display for the entire six weeks of the program).

PROBLEM SOLVING

Step 1. What am I doing? What do I need?
2. Decide, and make your plan to reach that goal.
3. Can I follow this plan?
(Yes? Go to 4)
(No? Go to 2)
4. Do it NOW*
5. Is the plan working?
(Yes? Go to 6)
(No? Go to 1)
6. Can I make it better?
(Yes? Return to step 1)
(No? Good, you're done)

The follow-up to this introduction should take place the following day with the students being reminded of the model through a simple discussion on organizing oneself for the approaching lesson, thus eliciting the desired questions "What am I going to do?", and "How am I going to do it?"

Simple everyday problems will be then practised to allow the students to familiarize themselves with these two initial steps of the SIPS model. Scoring for the purpose of student motivation will then be ranked for each student's competency in their ability to organise their problem solving techniques (see above ranking). The initial scoring of 1-5 for Basic Problem Solving will be discussed with the group members. This is seen as an important aspect for understanding the individual responsibility for learning that SIPS imposes.

The program will be run for six weeks and implemented in a variety of modes and lesson activities (number, cooking, general organisation, shopping, crafts, cleaning up/domestic skills and excursion activities). The actual implementation of SIPS in these lessons is simply to remind the students of the 6-steps of SIPS and to encourage its use.

Initially it is expected that the students will be uncomfortable using overt speech with many comments such as "Ha, ha, he/she's talking to him/herself!", however, with strong teacher encouragement and at times, teacher modelling, the students should soon became accepting of the necessity of overt speech. Many students will move quickly from the overt level of performance to the more discreet covert level, however, for the purpose of ranking, it will be necessary to ask for an overt demonstration periodically.

Reinforcement in the form of justification for the SIPS model will be continually needed, and the teacher will frequently need to remind the group of the importance to "organize the mind- if your mind is more organized, your work will be more organized...".

Expectations.

In the initial stages of the program, it will be apparent that the class will be unable to organize their cognitive structures, as most simply will have no idea how to approach a new problem, indeed, most will have no idea how to approach many of the daily tasks necessary for their progression through a days work and play! This will be reflected in the initial low scores of 1's and 2's for the Basic Problem Solving baseline.

As the program continues, a pattern is expected to emerge that the researcher has labelled "The Black Hole". This is exemplified in the following dialogue.

"What am I doing?"
"Number"*
"What do I need?"
"Pen, ruler, book, rods.."
"Can I do/get this?"
"Yes...(vague look)..and then I mark it and get a number game."
"Do it NOW"

At this stage it would be obvious that this student has little or no idea how to organize the thought processes to verbalize the steps of solving his/her presented problem, which, in this example is a number algorithm.

This apparent lack of attack strategy, labelled "The Black Hole" may remain evident well into the second and third weeks of the SIPS program. However, it will also be apparent that this "Black Hole" will slowly be replaced with worthwhile strategies as the program enters the third and fourth weeks. This is exemplified in the following dialogue-

"What am I doing?"
"Number-subtractions."
"What do I need?"
"Pen, ruler, book, rods...."
"Can I make a plan?
"Yes; first I start with the units column and see if I can subtract the bottom line from the top line....I can't, so I must regroup. So I take a 10 and regroup it over to the units....the eighty one becomes seventy eleven....now I can go on...."
"Do it NOW."

Contrary to the first example, this student should now be well on the way to completing the task.

Evaluation

Evaluation of the program will be carried out by the researcher by way of post-program testing.

APPENDIX 3.

APPENDIX 3.

SIPS PROGRAM 6-STEP WALL DISPLAY

PROBLEM SOLVING

Step 1. What am I doing? What do I need?

2. Decide, and make your plan to reach that goal.

3. Can I follow this plan?

(Yes? Go to 4)

(No? Go to 2)

4. Do it NOW*

5. Is the plan working?

(Yes? Go to 6)

(No? Go to 1)

6. Can I make it better?

(Yes? Return to step 1)

(No? Good, you're done)

APPENDIX 4.

A COGNITIVE APPROACH FOR IMPROVING THE GENERALISATION OF SKILLS WITH DISABLED CHILDREN.

Judith V. Hall. and Lyn Gow.

The pilot study provided the basis for the research encompassed in this thesis by Hall.

It has also proven useful for other work subsequently undertaken by Gow and her colleagues.

The plan is to submit a version of the pilot work by Hall and Gow to a suitable journal and for this reason it is presented here as a free standing document, complete with appropriate references.

INTRODUCTION

There is ample evidence to suggest that intellectually disabled people do not use active strategies for learning or solving problems (Ferretti & Belmont, 1983; Gow, in press; Gow, Ward & Balla, 1985; Havertape & Kass, 1977; Maker, 1981; Padawer Zupan & Kendall, 1980; Ward and Gow, 1982). For instance, Havertape and Kass in 1977 found that intellectually disabled students were less proficient than normally achieving students and that 40% of the intellectually disabled group's responses consisted of random or impulsive answers without any relationship to the problem requirements. They concluded that intellectually disabled students lack attack strategies in problem solution. Moreover, they deduced that those who possess some strategies do not use them effectively. In attempting to explain the passive, rather than active, participation of intellectually disabled people in the learning process Maker (1981) argued that it could be related to their inability to generalise a previously learned problem-solving strategy to a new problem.

Unfortunately, this problem area of generalisation of training has been seriously neglected (Ward & Gow, 1982), inspite of the widely-held belief that generalisation is arguably the most important unsolved problem of education and psychology (Gow & Butterfield, in press). This neglect was identified by Stokes & Baer (1977), who noted that most studies claiming to have achieved generalisation involved training followed by "hope" that was expected to happen without programming.

Unsuitability of behaviour modification techniques

To date, ABA research has paid insufficient attention to generalisation, focusing instead almost exclusively on merely changing behaviour for a specific task in a specific situation (Gow, 1984). As a result students learn to react with a desired response only to the extremely limited experiences offered in the classroom or training situation (Gow, in press; Gow, Ward and Balla, 1985; Maker, 1981).

Gow summarises deficiencies in applied behavior analysis as follows:

> "1. Some of the procedures have failed to affect significantly the behavior of a certain number of subjects. 2. Some of the procedures do not work consistently with all subjects. 3. A particular procedure may work for a limited period of time, but be unsuccessful over time. 4. Some procedures do not result in a generalisation of training effects. 5. Often, on withdrawal of the program, the trained behaviors do not maintain" (in press:4).

In an effort to explain these deficiencies, Gow (1985) argues that ABA procedures have not provided the learner with internalised strategies for approaching new tasks, and as such the learner usually becomes welded to the training situation. In addition, the control of learning is external to the learner: the instructor, rather than the learner, decides on the goal and the means of reaching that goal.

Instructional design adopted by ABA workers can also be a factor in the ineffective generalisation of skills (Ferretti & Belmont, 1983). Some see the failure of ABA techniques to result in generalisation to be a result of a basic failure to apply behavioural methods adequately rather than from any innate limitations to this approach (Ward and Gow, 1982). Too much emphasis in instructional design has been placed on task analysis of the defined curriculum objectives and identification of a set of the component skills and their assumed prerequisites. This is usually followed by diagnosis, remediation and some form of assessment of the specific objective. Rarely, however, is any attention given to programming for, or assessment of, generalisation.

New wave of cognitive theory.

Largely because of the persistent difficulties reported with applied-behavior analysis (ABA) techniques of achieving generalisation, there has been a dramatic move in recent years away from this instructional approach which has been used traditionally with people with intellectual disabilities. Education of students with intellectual disabilities has moved towards more cognitive approaches with an emphasis on cognitive processes and problem solving (Gow, 1986).

Cognitive programs of instruction have been developed most notably by Brown-Campione and their colleagues (Reciprocal Teaching) , Meichenbaum (Verbal Self-Instruction), Gow (Self-Instruction Problem Solving), Das (Similtaneous/Successive Information Processing), and Feuerstein (Instrumental Enrichment). Conway and Gow (in preparation) note that, while the terminology used to describe these programs varies considerably, there is marked overlap in the techniques adopted, largely because they have all been derived, either directly or indirectly, from the theoretical work of the Russian psychologists Luria and Vygotsky.

These programs all teach cognitive strategies. A cognitive strategy can be viewed as an internally organised skill that enables the selection and guidance of the internal processes involved in defining and solving problems. In other words, cognitive strategies are skills by means of which the learner manages his/her own thinking behaviour, which in turn effects overt or observable behaviour. Thus, through using cognitive strategies, an individual can learn to control his/her own behaviour, with clear implications for the efficiency of education (Gow, in press).

Results of studies to date have demonstrated the potential of cognitive strategy training in enhansing generalisation (see Gow & Ward, 1985). Cognitive training has been shown to result in more generalisation of skills than applied behaviour analysis (Gow, Ward & Balla, 1985). In a review of the effects of three intervention strategies- medication, behavior modification and cognitive training, Keogh and Barkett in 1979 concluded that:

> "although different interventions generally influence different aspects of performance, cognitive training appears to offer the greatest possibility of transfer or generalisation" (in Maker, 1981:137).

The purpose of this paper is to describe the implementation of one of these cognitive programs: Self-Instruction Problem Solving.

SELF INSTRUCTION PROBLEM SOLVING (SIPS).

Gow has developed an instructional approach called Self-Instruction Problem Solving. SIPS has evolved from ten years of investigation of Meichenbaum's Verbal Self-Instruction technique (see Meichenbaum, 1977). VSIT has successfully promoted generalisation of skills in previous studies (see Gow, in press; Gow & Ward, 1985; Gow, Ward and Balla, 1985; Ward and Gow, 1982).

The main purpose of SIPS is to provide the learner with a portable and durable strategy to promote generalisation of skills across the episodic situations of real-life experiences. Gow (in press) states that to be successful, an instructional approach should not only facilitate skill acquisition but also generalisation. In addition it should be economical and create minimal interference to the regular program (Gow, 1986).

Gow & Ward (1985) argue that teaching the basic principles of thinking and problem solving through the use of cognitive learning strategies should increase the effectiveness of academic and social learning.

The teaching principles underlying SIPS are simple. The goal is to teach "HOW", not "WHY" (i.e. only when the learner needs correction). The SIPS approach requires that learners take responsibility for their own learning, with each new task being presented as a "problem" which must be solved by the learner with minimal intervention by the instructor. The instructor must minimise the use of external reinforcement and feedback since a desired outcome of any program of instruction should be autonomous behaviour (Gow, in press). A model is provided only when the learner demonstrates either overtly or covertly that he or she cannot proceed with the task.

To work out a solution to the problem, the learner self-instructs using two broad types of self-instructions: general and specific. A general self-instruction (or process component of instruction)- e.g. "Stop! What am I going to do? How am I going to do it?- serves to focus the attention of the individual on the task. These general self-instructions prompt the specific verbalisations (or substantive instructional components)- e.g."I pick up these two pieces first..") - which are required to guide performance through the task.

The general verbalisations provide the individual with "portable coping strategies" which can effectively be applied to a wide array of problem contexts and settings. It is therefore these verbalisations which potentially promote geeater generalisation. However, research has demonstrated that a combination of general and specific self-instructions is necessary to promote maximum generalisation outcomes (Gow in press).

Unlike cognitive programs which guide the learner's performance through direct modelling (e.g Meichenbaum's verbal self-instruction, Brown and Campione's Reciprocal Teaching,and Das' Simultaneous/Successive Information Processing), Gow stresses the need for verbal self-instructions to be comparable with the style of the individual and, to be self initiated.

Therefore, the learner is encouraged to use his or her own language rather than repeat the specific verbalisations given by the model/instructor.

The Gow program also requires instruction across settings and suggests peer tutoring as a means of achieving this (Gow, 1986; Gow, in press). Another feature is "ecological validity", that is, the need to train in an environment legitimate to the skill being taught. This is seen as a useful technique, not only for enhancing acquisition of skills but also for facilitating generalisation outcomes (Gow, in press; Ward & Gow, 1982).

Gow's SIPS approach has evolved from a decade of research, and has been trialled with 220 mildly to severely intellectually disabled adolescents and adults (see Gow,Ward & Balla, 1985). SIPS has been shown to be more efficient than Applied Behaviour Analysis Technique (ABA) in achieving generalisation outcomes. It is simple to implement, as it requires no sophisticated equipment and can be mastered quickly by instructors (Gow, in press).

AIM.

The aim of this pilot study was to examine the utility of SIPS with two groups of children: mildly intellectually disabled primary students; and visually impaired high school students.

The literature suggests that SIPS should be successful with mildly intellectually disabled children, however, it is equivocal with respect to normal intelligenced physically disabled people. Martin (1984) reported a study in which hearing impaired students with normal intelligence were found to benefit by a cognitive-behaviour modification training program. Maker notes the following possible constraints with implications for working with such children:

> "Also important to the success of a cognitive modification approach is a consideration of the age and maturity of the children involved... overt self-instruction may interfere with the performance of older or high I.Q. children.....it seems that once a behaviour has been mastered and is regulated by private speech, imposition of overt verbalisation interferes with performance" (1981:137) (authors' underline).

METHOD.

Subjects

Two small groups of students were selected for this pilot study. Group 1 consisted of 13 mildly intellectually disabled primary-aged students with age range 9 to 12 years and I.Q. range 55-80 on WISC scale. Group 2 was comprised of 5 normal-intelligenced secondary aged-students with visual impairment considered severe enough to handicap these students in their physical environment (according to the criteria adopted by the Department of Education).

Procedures.

To elicite the desired questions "What am I going to do?", and, "How am I going to do it?", the students partook of an unstructured discussion on skills required for organising oneself. Simple everyday problems were then practised to allow the students to familiarise themselves with these two initial steps of the SIPS model.

Each student's competency in their ability to organise their problem solving techniques was ranked on a 1-5 scale, thereby establishing a baseline thus:

1.= no idea of what s/he was supposed to be doing
2.= knew **what** s/he was supposed to be doing but had no idea **how** s/he was going to do it
3.= fair idea of **what** but a vague idea only of **how**
4.= good idea of **what** and a fair idea of **how** but not able to execute plan
5.= good idea of both **what** and **how** and able to execute the plan.

The groups were taught and rehearsed a six-step problem solving strategy, being-

Step 1. What am I doing?
2. What do I need?
3. Can I do/get this?
4. Do it NOW.
5. Is it good?
6. Can I make it better?
(If "yes", return to step 2)

The Special Education instructors for the two groups were responsible for the teaching and training.

The program for Group 1 (mildly intellectually impaired) was run for six weeks and implemented in a variety of domains (number, cooking, general organisation, shopping, crafts, cleaning up/domestic skills and excursion activities).

The program for Group 2. (visually impaired) was used across a variety of settings consistant with a secondary timetable (e.g students were in a group; student was in a withdrawal situation; student was with another instructor; and, over different subject and environmental situations). While it was felt that these students were already capable of organising their problem solving processes (see results), one student initially needed frequent prompting and demonstration modelling.

RESULTS.

The instructor for Group 1 (mildly intellectually disabled) initially scored eleven students from this group at or below 2 in their use of the strategy. While no students from this group scored 5, one student scored 4 and another scored 3. The scores were unrelated to age, sex or I.Q. score for the individual student. The initial scores of 1-4 were discussed with the group members and it was interesting to note that all students felt their individual scores should have been higher, however they were happy with their group-peers' scores.

The instructor of Group 2. (visually impaired) found that all but one of the students in this group scored 5 with the remaining student scoring 1. This is most likely due to the fact that these students, being older and of normal intelligence, had well structured cognitive systems (Maker, 1981). These students self-initiated the strategy. The only remaining student in this group was reminded to use the SIPS model before each lesson over the subsequent six weeks. At the beginning of the program, to the initial step "What am I going to do?" this student most frequently answered "I don't know". The student appeared very anxious about the entire program and in particular to the overt verbalisations. As the program entered its third and fourth weeks, the student was noted to be spending more time on task and to be using covert verbalisations.

It is of interest to note that while the program continued, a pattern emerged, particularly with the mildly intellectually disabled group. The authors have labelled this pattern "The Black Hole". This is exemplified in the following dialogue.

"What am I doing?"
"Number".
"What do I need?"
"Pen, ruler, book, rods.."
"Can I do/get this?"
"Yes...(vague look)..and then I mark it and get a number game."
"Do it NOW"

At this stage it was obvious to the instructors that the students had little or no idea of how to organise their thought processes and enable them to verbalise the steps of solving the presented problem (which in this example is a number algorithm). This would appear to support the findings of Havertape and Kass (1977), who in their related research, found that 40% of learning disabled student's responses were random or impulsive answers without any relationship to the problem requirements. Consistent with this assumption, the students in Group 1 displayed few attack strategies and those who did in fact possess some strategies, still showed no evidence of using them effectively.

This lack of attack strategy remained evident well into the second and third weeks of the SIPS program. However, it was also apparent that this "Black Hole" was slowly replaced with a problem solving strategy as the program entered the third and fourth weeks. This is exemplified in the following dialogue-

"What am I doing?"
"Number-subtractions."
"What do I need?"
"Pen, ruler, book, rods...."
"Can I do/get this?"
"Yes; first I start with the units column and see if I can subtract the bottom line from the top line....I can't, so I must regroup. So I take a 10 and regroup it over to the units....the eighty one becomes seventy eleven....now I can go on...."
"Do it NOW."

Contrary to the earlier example before training started, this student was now well on the way to completing the task.

Initially the students were uncomfortable using overt speech and made comments such as "Ha, ha, she's talking to herself!". However, with instructor modelling, the students soon accepted overt speech as a part of their academic routine.

Reinforcement for the use of SIPS was needed at the beginning of the program. The instructor of the mildly intellectually disabled group frequently reminded the group of the importance to "organise the mind- if your mind is more organised, your work will be more organised...". The instructor of the visually impaired subjects similarly reminded the initially low rating student.

Throughout the duration of the program, the individual mildly intellectually disabled students all improved their scores. There was no general pattern to the improvement, although both instructors observed that the program was most useful in the mathematics/logic areas, an observation that requires further investigation. Towards the completion of the program, each student had scored at least one 5, with most students consistently scoring 5's.

The instructor of the visually impaired students found that at the conclusion of the program, the students were continuing to score 5's for all tasks with the exception of the one student who demonstrated frustrations throughout the entire program. This student was, however, more frequently scoring 4's and 5's for the daily problems and tasks associated with school and general environment.

DISCUSSION.

SIPS was successful in developing problem solving techniques for students experiencing difficulties in the organisation of their executive cognitive system. In particular, the SIPS program appeared to support the intellectually disabled students. Therefore, this pilot study with SIPS suggest that the SIPS model might prove very successful with mildly intellectually disabled primary students and further research is definitely warranted in this area. However, this pilot study also supports the earlier observations by Maker (1981) that in any cognitive modification approach it is necessary to consider the age and maturity of the children involved, for it was apparent that the model offered little to normal intelligenced, older students.

In the initial stages of the program, it was apparent that Group 1 (mildly intellectually disabled) had difficulty in approaching a new problem. This finding lends support to the earlier observations of Havertape and Kass (1977), that is, this mildly intellectually disabled group did not have the skills necessary for their progression through a days' work and play! This was reflected in the initial low scores of 1's and 2's.

During the initial stages of the program the students displayed discomfort to the overt verbalisations, however, this was soon overcome as the students became more familiar with the model, or, alternately, as the students replaced the overt verbalisations with the preferred covert levels of private speech. Similarly, students from Group 2 reported that in some cases other instructors found it difficult to work while they were "all talking in class".

Optimum instructor direction and the subjectiveness of when to transfer control to the learner was also thought to be an area of concern. The difficulty in instructor decision as to when to intervene in these times of error making must be further viewed. However, it is possible that this will most likely always remain a difficulty as the instructor is effectively assessing anothers' cognitive style within the limitations of his/her own cognitive systems. There may well be a thin line between one thinker's overt verbalisations and another thinker's irrelevant mumblings! This is further complicated as other instructors rank generalisation of skills across other domains, e.g. parent ranking a domestic task.

For the SIPS model to develop successfully, and the student to develop "portable problem solving strategies", the student must feel comfortable and unthreatened in his/her environment. The student MUST feel free to make errors, as these can supply valuable learning experiences.

The SIPS model was proposed to allow the learner to take responsibility for his/her own learning (Gow, in press) and therefore was considered effective despite little or no feedback to the pupil (Gow, Ward and Balla, 1985). Consistent with this claim, the instructors in this study found that the students did not require the constant feedback and behaviour reinforcement usually associated with ABA techniques.

This pilot study suggests that there is need for more research in this field of metacognition, particularly with school aged students.

Perhaps the words of a student from the mildly intellectually impaired group most adequately sums up the SIPS model; "Great, I like it- it really helps".

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APPENDIX 5.

APPENDIX 5.1. BASIC PROBLEM SOLVING RATING

Each student rated 1-5 on following scale.

1.=no idea of what he/she was supposed to be doing

2.=knew what he/she was supposed to be doing but had no idea how he/she was going to do it

3.=fair idea of what but a vague idea only of how

4.=good idea of what and a fair idea of how but not able to execute plan

5.=good idea of both what and how and able to execute the plan.

APPENDIX 5.2a. NEALE B.

SECOND EDITION

NEALE
ANALYSIS OF READING ABILITY

By M. D. NEALE, Ph.D., M.A., Dip.Ed., Dip.Psych.

INDIVIDUAL RECORD SHEET — FORM B

Name ______________________ School ______________________

Sex __________ Age __________ Date of Birth __________ I.Q. __________

Family M/F ______________________ Examiner __________ Date __________

INITIAL INTERVIEW

Appearance ______________________

Hearing __________ Eyesight __________

Interests ______________________

Pertinent Emotional Difficulties ______________________

Attitude to Reading. Likes "a little" ______ "a lot" ______ "not really" ______

Attitude to School. Likes "a little" ______ "a lot" ______ "not really" ______

QUALITATIVE ASSESSMENT

PERSONAL CHARACTERISTICS

Needs encouragement to begin reading __________

Refuses to try unknown words __________

Repeats words or phrases habitually __________

Reads in a quiet ______ loud ______

mumbled ______ hurried ______ voice

WORD RECOGNITION

Guesses at unknown words __________

Reverses words __________

Uses contextual clues __________

Spells out words __________

Sounds out letter combinations but cannot synthesize __________

Does not know letters __________

Does not know sounds __________

GENERAL READING HABITS

Reads word by word __________

Ignores punctuation __________

Enunciation. Poor ______ Average ______ Good ______

Holds reading close to face __________

Uses finger as pointer __________

Loses place frequently __________

Head movements. Marked ______ Slight ______

TEST SUMMARY

Passage	Words read	Time in secs.	Errors	Accuracy score	Compre-hension
1	26			=	
2	75			=	
3	147			=	
4	239			=	
5	357			=	
6	496			=	
Totals		*			

Reading Ages

$$* \text{ Words per min.} = \frac{\text{Words}}{\text{Time}} \times \frac{60}{1} = - \times \frac{60}{1}$$

Choice of Story __________

Comments or Recommendations __________

1 PAM'S BOX (26)	Mis*	Sub	Ref	Add	Oms	Rev
Father						
gave						
Pam						
a						
big						
box.						
Pam						
put						
it						
on						
the						
table.						
She						
looked						
in						

Questions 1. Who gave Pam the box?
2. Where did Pam put the box?

1 continued	Mis	Sub	Ref	Add	Oms	Rev
the						
box						
for						
a						
doll.						
Then						
out						
jumped						
a						
white						
rabbit.						

Errors ....
Time ....
Comprehension ....

3. What did she think would be in the box?
4. What was the surprise?

2 WOODMAN (49)	Mis	Sub	Ref	Add	Oms	Rev
John						
and Ann						
were fishing.						
Suddenly						
they						
heard						
a splash.						
A woodman						
had fallen						
into the						
lake.						
He could						
not swim,						
for he was						
hurt. The						
children						
tried						

Questions 1. What were John and Ann doing at the lake?
2. What noise did they hear?
3. What had happened?
4. Why could the man not swim ashore?

2 continued	Mis	Sub	Ref	Add	Oms	Rev
to pull						
him ashore.						
He was						
too heavy.						
Then John						
held the						
man's						
head						
above						
water						
and Ann						
ran for						
help						

Errors ....
Time ....
Comprehension ....

5. What did the children try to do?
6. Why were they unable to pull him ashore?
7. How did John help the man?
8. How did Ann help?

3 PUPPET (72)	Mis	Sub	Ref	Add	Oms	Rev
The Swiss						
puppet						
watched						
the children						
arranging						
the puppet						
theatre. He						
felt useless.						
He was not						
often						
chosen						
to act						
because he wore						
unusual						
clothes. Now the						
children were						
discussing their						
new play. "We						
need a brave						
person for						
the mountain						

Questions 1. What was the Swiss puppet watching in the beginning of the story?
2. Why did he feel useless?
3. Why was the Swiss puppet not chosen very often for the plays?
4. What kind of hero did the boy want for the new play?

3 continued	Mis	Sub	Ref	Add	Oms	Rev
rescue,"						
explained						
a boy. Each						
puppet tried						
to appear like						
the required						
hero.						
Then cheers						
greeted						
the boy's						
choice. On						
to the stage						
was raised						
the shy						
but happy						
Swiss						
puppet.						

Errors ....
Time ....
Comprehension ....

5. What kind of work would the hero have to do in the play?
6. What did all the puppets hope?
7. How do you know that everyone was pleased with the hero that was chosen?
8. How did the Swiss puppet feel when he was chosen?

4 EXPLORING (92)	Mis	Sub	Ref	Add	Oms	Rev
It was midnight.						
A mournful						
wailing sound						
echoed through						
the deserted						
castle. The						
girls ceased						
exploring						
abruptly.						
"Ghosts!"						
whispered one						
girl. "Nonsense!"						
replied the other,						
but nevertheless						
she proceeded						
cautiously in						
the direction of						
the mysterious						
noise. Gathering						
courage, and						
with mounting						
curiosity, the						

4 continued	Mis	Sub	Ref	Add	Oms	Rev
girls approached						
the old kitchen.						
Then scarcely						
daring to breathe,						
they swung open						
the door. Their						
torches searched						
the darkness and						
immediately their						
excitement turned						
to pity. Before						
them, almost						
exhausted, lay						
the farmer's dog.						
He had been						
imprisoned while						
hunting for rats						
by a gust of wind.						

Errors

Time

Comprehension

Questions

1. At what time did the girls go to the castle?
2. What were the girls doing at the castle?
3. What made them stop exploring?
4. Why did they go cautiously in the direction of the noise?
5. From where was the noise coming?
6. What did they discover?
7. What had the dog been doing there?
8. Why did the girls feel sorry for him?

5 ARABS (118)	Mis	Sub	Ref	Add	Oms	Rev
After a brief						
encounter						
with the Turks,						
Lawrence and						
his Arab force						
made a mock						
retreat. Although						
out-numbered,						
Lawrence						
guessed that						
surprise tactics						
might retrieve						
the campaign.						
Accordingly, as						
his followers						
withdrew,						
they concealed						
themselves in						
the rocky						
crevices						
of a narrow						
gorge						
leading to the						
city. Meanwhile						
the women,						
acquainted with						
the circumstances,						
prepared to						
defend the city						
gates. The						
success of						

5 continued	Mis	Sub	Ref	Add	Oms	Rev
Lawrence's						
plan depended						
on whether						
the Turks						
would assume						
that the Arab						
retreat						
was genuine.						
There was an						
interval						
of terrible						
tension. Then						
the unsuspecting						
Turks stormed						
in hot pursuit						
into the pass.						
At once,						
concentrated						
rifle fire swept						
their column.						
The troops						
fell into a						
panic, for						
the confined						
space permitted						
no counter						
attack.						

Errors

Time

Comprehension

Questions

1. Which two armies were taking part in this battle?
2. Which army was Lawrence leading?
3. Which side had the greater numbers?
4. What did Lawrence tell his men to do?
5. What did Lawrence hope that the Turks would think?
6. What part were the women taking in the battle?
7. Why did the Turks pursue the Arab force into the pass?
8. Why were the Turks unable to fight back successfully?

** Mispronunciations, Substitutions, Refusals, Additions, Omissions, Reversals*

6 VOLCANO (139)	Mis	Sub	Ref	Add	Oms	Rev
Fascinated by						
the prospect						
of recording						
the spectacle of						
a long-dormant						
volcano						
smouldering						
again, the two						
scientists						
approached the						
crater's edge.						
Intent on their						
photography,						
they ignored						
an ominous						
rumbling. In						
reproof, the						
subterranean						
cauldron						
suddenly exploded						
violently,						
ejecting a						
great quantity						
of rocks.						
Fortunately						
these fell on						
to the opposite						
slopes. Greatly						
alarmed by this						
premature						
eruption, the						
men hastily						
began the descent.						
Instantly a						
gigantic						
avalanche						
of fiery						

6 continued	Mis	Sub	Ref	Add	Oms	Rev
boulders						
hurtled						
around them.						
Aware that						
their apparatus						
hindered						
progress, they						
abandoned all						
equipment						
except their						
precious						
cameras. Then						
came an anxious						
moment. As one						
man was evading						
a flying fragment,						
he was struck						
off-balance						
by a rebounding						
boulder. A						
lengthy halt						
would have been						
disastrous. It						
was, therefore,						
with immense						
relief that						
they discovered						
his injuries to						
be superficial						
and resumed						
the fantastic						
scramble to the						
safety zone.						

Errors ____________

Time ____________

Comprehension ____________

Questions

1. What were the scientists doing on the volcano?
2. Why was this volcano so interesting?
3. What warning should the men have noted?
4. Whereabouts were the men when the volcano exploded?
5. How did they escape from the first explosion?
6. What did they do to speed up their descent?
7. What kind of material was ejected by the volcano?
8. Were the man's injuries serious or slight?

SUPPLEMENTARY DIAGNOSTIC TEST 1.

What are the names and sounds of these letters?

a	c	o	e		
f	t	k	h	l	
p	d	b	g	q	y
m	w	n	r	u	v

s	z	x	i	j				
A	H	K	F	E	L	I	T	X
C	G	O	Q	P	R	D	B	J
M	N	U	V	Y	W	S	Z	

SUPPLEMENTARY DIAGNOSTIC TEST 2.

Auditory discrimination through simple spelling.

1.	tap	man	rat
2.	beg	red	pet
3.	tin	lip	ink
4.	fold	bolt	cold
5.	but	mug	hutch
6.	show	star	sport
7.	every	bridge	chicken
8.	girl	grid	grumble

SUPPLEMENTARY DIAGNOSTIC TEST 3.

Blending and recognition of syllables.

1.	c- old	d- ear	l- ock	t- ask
2.	m- ouse	l- augh	s- ight	b- urnt
3.	ch- ill	br- ake	th- ief	gr- owl

APPENDIX 5.2b. NEALE C.

SECOND EDITION

NEALE
ANALYSIS OF READING ABILITY

By M. D. NEALE, Ph.D., M.A., Dip.Ed., Dip.Psych.

INDIVIDUAL RECORD SHEET — FORM C

Name .... School ....

Sex .... Age .... Date of Birth .... I.Q. ....

Family M F .... Examiner .... Date ....

INITIAL INTERVIEW

Appearance ....

Hearing .... Eyesight ....

Interests ....

Pertinent Emotional Difficulties ....

Attitude to Reading. Likes "a little" .... "a lot" .... "not really" ....

Attitude to School. Likes "a little" .... "a lot" .... "not really" ....

QUALITATIVE ASSESSMENT

PERSONAL CHARACTERISTICS

Needs encouragement to begin reading ....

Refuses to try unknown words ....

Repeats words or phrases habitually ....

Reads in a quiet .... loud ....

mumbled .... hurried .... voice

WORD RECOGNITION

Guesses at unknown words ....

Reverses words ....

Uses contextual clues ....

Spells out words ....

Sounds out letter combinations but cannot synthesize ....

Does not know letters ....

Does not know sounds ....

GENERAL READING HABITS

Reads word by word ....

Ignores punctuation ....

Enunciation. Poor .... Average .... Good ....

Holds reading close to face ....

Uses finger as pointer ....

Loses place frequently ....

Head movements. Marked .... Slight ....

TEST SUMMARY

Passage	Words read	Time in secs.	Errors	Accuracy score	Comprehension
1	26		=		
2	75		=		
3	147		=		
4	238		=		
5	356		=		
6	495		=		
Totals		*			

Reading Ages

* Words per min. $= \frac{\text{Words}}{\text{Time}} \times \frac{60}{1} = - \times \frac{60}{1}$

Choice of Story ....

Comments or Recommendations ....

1 ROBIN (26)	Mis*	Sub	Ref	Add	Oms	Rev
A						
robin						
hopped						
up						
to						
my						
window.						
I						
gave						
her						
some						
bread.						
She						
made						
a						

1 continued	Mis	Sub	Ref	Add	Oms	Rev
nest						
in						
my						
garden.						
Now						
I						
look						
after						
her						
little						
birds.						

Errors ....

Time ....

Comprehension ....

Questions

1. Where was the little boy/girl standing when the robin hopped up to him/her?
2. What did the little boy/girl give the robin?
3. What did the robin do in the garden?
4. How does the little boy/girl help the robin now?

2 PARCEL (49)	Mis	Sub	Ref	Add	Oms	Rev
A surprise						
parcel						
for Jane						
and Peter						
arrived						
on Saturday.						
Peter						
looked at						
the strange						
stamps.						
Jane undid						
the string.						
Then they						
shouted						
with delight.						
Uncle						
had sent						

2 continued	Mis	Sub	Ref	Add	Oms	Rev
some						
skates						
for Jane						
and an						
electric						
train						
for Peter.						
They were						
what the						
children						
had wanted						
for a long						
time.						

Errors ....

Time ....

Comprehension ....

Questions

1. On what day did the parcel arrive?
2. How do you know that Jane and Peter were not expecting the parcel?
3. Who undid the string?
4. How do you know that the parcel came from another country?
5. Who had sent the parcel?
6. What was in the parcel for Jane?
7. What was in the parcel for Peter?
8. Why were the children so pleased to receive these presents?

3 ALI (72)	Mis	Sub	Ref	Add	Oms	Rev
As Ali						
sheltered in						
a ruined						
temple,						
his shoulder						
knocked						
against						
a secret						
spring.						
Instantly he						
was thrown into						
an underground						
room. In the						
darkness the						
walls appeared						
to be decorated						
with precious						
jewels.						
Ali rested						
awhile. He						
remembered						

3 continued	Mis	Sub	Ref	Add	Oms	Rev
that desert						
travellers						
often imagined						
queer things.						
Later he						
explored						
the place						
for means of						
escape. To his						
amazement the						
treasure did						
not vanish. He						
had discovered						
a buried						
palace						
of former						
times.						

Errors ....

Time ....

Comprehension ....

Questions

1. Why did Ali go into the temple?
2. How did he find the secret spring?
3. What happened when he touched the spring?
4. What did he see there?
5. Why did Ali not rush to look at the jewels?
6. After he had rested, what did Ali try to find?
7. Why was he so surprised?
8. How had the jewels come to be there?

* *Mispronunciations, Substitutions, Refusals, Additions, Omissions, Reversals*

4 SPORTS DAY (91)	Mis	Sub	Ref	Add	Oms	Rev
Susan hurried						
to the starting						
position for						
the relay race.						
Last year her						
team had been						
disqualified						
for not						
transferring						
the baton						
properly. Now						
they were						
determined						
to avenge						
their defeat. But						
what was this?						
Susan inspected						
one shoe. The						
sole had broken						
loose in the						
obstacle						
event. Her						
heart sank.						
The track was						

4 continued	Mis	Sub	Ref	Add	Oms	Rev
unsuitable						
for running						
barefoot. Her						
plight, however,						
had been						
observed. "Try						
mine," insisted						
Philip, a						
reserve runner,						
unfastening						
his shoes.						
Luckily they						
fitted, and						
later, Philip						
shared the						
honours when						
his school						
was awarded						
the athletic						
shield.						

Errors ....

Time ....

Comprehension ....

Questions

1. In what kind of race was Susan's team competing?
2. Why was her team so keen to win?
3. Why had they been disqualified last year?
4. What did Susan suddenly discover?
5. In what race had the sole of her shoe broken loose?
6. Why was there no time to fetch another pair of shoes?
7. How did Philip help Susan?
8. How was Philip rewarded for his kind act?

5 THE FOX (118)	Mis	Sub	Ref	Add	Oms	Rev
Among animals						
the fox has						
no rival						
for cunning.						
Suspicious						
of man, who is						
its only natural						
enemy, it will,						
when pursued,						
perform						
extraordinary						
feats, even						
alighting on						
the backs of						
sheep to divert						
its scent						
trail.						
Parent foxes						
share the						
responsibilities						
of cub-rearing.						
Through their						
hunting						
expeditions						
they acquire						
an uncanny						
knowledge						
of their						
surroundings,						
which they use						
in an emergency.						

5 continued	Mis	Sub	Ref	Add	Oms	Rev
This is well						
illustrated by						
the story of						
a hunted fox						
which led its						
pursuers to						
a neglected						
mine-shaft						
enclosed by a						
circular hedge.						
Swiftly it						
mounted the						
barrier. The						
hounds followed,						
only to be						
drowned in the						
accumulated						
water fifteen						
metres below. The						
fox, however,						
apparently on						
familiar						
territory,						
skirted						
the hedge						
and subsequently						
escaped.						

Errors ....

Time ....

Comprehension ....

Questions

1. Who is the chief enemy of the fox?
2. Why does a hunted fox sometimes jump on to the back of a sheep?
3. Who provides the food for the cubs?
4. How do foxes know the best hiding places in their surroundings?
5. To where did the fox in this story lead the hounds?
6. Was the mine working or had it been closed down?
7. How did the fox avoid falling into the water?
8. Why were the hounds unable to see the danger?

6 MIGRATION (139)

6 MIGRATION (139)	Mis	Sub	Ref	Add	Oms	Rev
Each April, at the						
re-appearance						
of the cuckoo in						
its familiar						
haunts, bird-						
watchers must						
marvel at the						
accurate						
flights with						
which birds span						
the distances						
between their						
seasonal						
abodes. What						
causes these						
regular						
journeys? The						
theory						
that rigorous						
winters compel						
birds to migrate						
is insufficient,						
for many migrate						
in summer.						
Likewise,						
it cannot						
be argued that						
the fledglings						
imitate the older						
generation,						
for the offspring						
generally migrate						
alone. The best						
explanation						
suggests that						
migration is an						
inborn custom,						

6 continued	Mis	Sub	Ref	Add	Oms	Rev
probably						
originating						
in some ancient						
era when the						
flights were						
necessary						
for survival.						
Most species						
favour						
particular						
routes. Thus,						
on one occasion						
when some storks						
from east						
Germany						
were captured						
and released						
among storks in						
west Germany,						
they did not						
accompany						
their relatives						
along the west-						
ern migration						
route. Instead,						
with unerring						
instinct, they						
re-discovered						
the traditional						
south-easterly						
path of their						
eastern						
ancestors.						

Errors __________

Time __________

Comprehension __________

Questions.

1. In which month can bird-watchers hope to see the cuckoo re-appear from its winter home?
2. Why do bird-watchers think that birds are such remarkable creatures?
3. Why is it wrong to say that cold weather makes all the birds migrate (fly away)?
4. Do the young birds learn the migration routes from their parents?
5. Is migration an old or recent custom?
6. In what country was an experiment done with storks?
7. What route did the eastern storks usually take when migrating?
8. In which direction did the eastern storks fly when they were taken to the west?

SUPPLEMENTARY DIAGNOSTIC TEST 1.

What are the names and sounds of these letters?

a	c	o	e					
f	t	k	h	l				
p	d	b	g	q	y			
m	w	n	r	u	v			

s	z	x	i	j				
A	H	K	F	E	L	I	T	X
C	G	O	Q	P	R	D	B	J
M	N	U	V	Y	W	S	Z	

SUPPLEMENTARY DIAGNOSTIC TEST 2.

Auditory discrimination through simple spelling.

1.	tap	man	rat
2.	beg	red	pet
3.	tin	lip	ink
4.	fold	bolt	cold
5.	but	mug	hutch
6.	show	star	sport
7.	every	bridge	chicken
8.	girl	grid	grumble

SUPPLEMENTARY DIAGNOSTIC TEST 3.

Blending and recognition of syllables.

1.	c- old	d- ear	l- ock	t- ask
2.	m- ouse	l- augh	s- ight	b- urnt
3.	ch- ill	br- ake	th- ief	gr- owl
4.	pic- nic	thr- oat	fly- ing	str- ong

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APPENDIX 5.3a. NUMBER TEST A.

PRACTICAL NUMBER TEST

1. Match the Unit with the Item

pocket money	metres
time	dollars & cents
milk	seconds
cost of chips	kilograms
length	litres
a lenght of wood	dollars & cents
how long a song lasts	seconds
weight	metres

2. Fill in the following

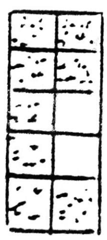
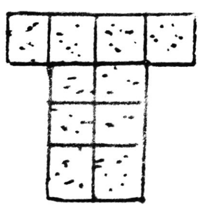
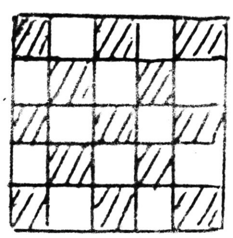
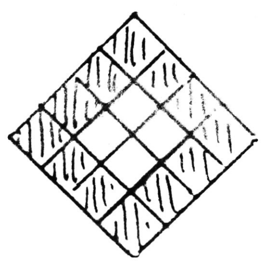
If 1 kilometre = 1,000 metres

then- 1 kilogram = ________ grams
1 kilojoule = ________ joules
1 kilowatt = ________ watts
1 kiloblogg = ________ bloggs

If 1 metre = 1,000 millimetres

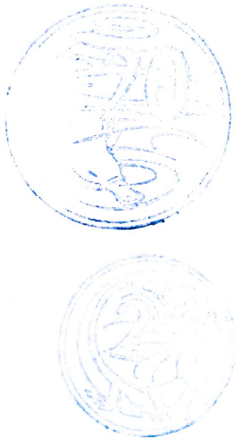
then- 1 litre = ________ millilitres
1 gram = ________ milligrams

3. How many shaded squares in each figure?

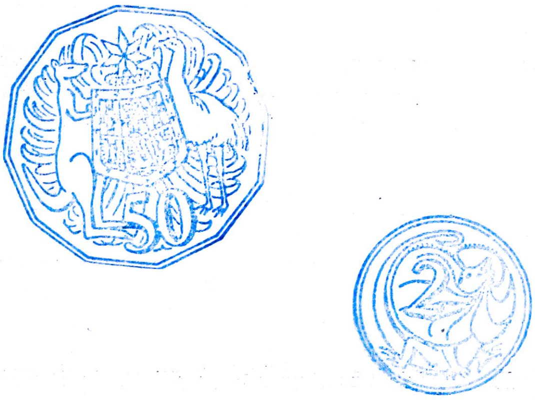
________ ________ ________ ________

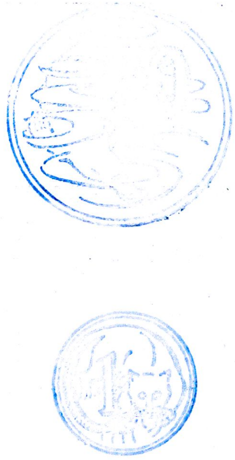
4. How many cents all together?



________ cents.

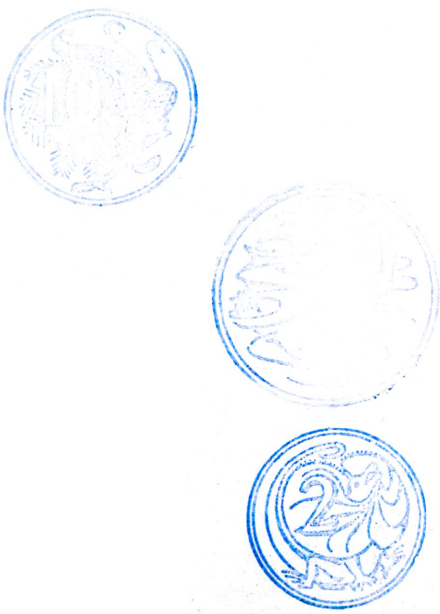
________ cents.

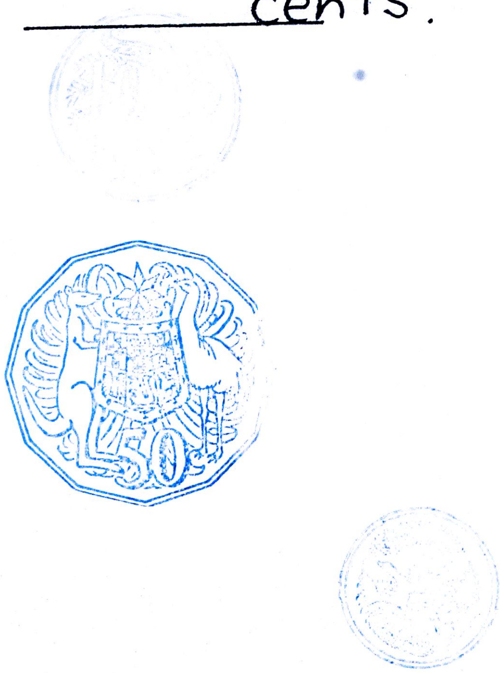




________ cents.

________ cents.

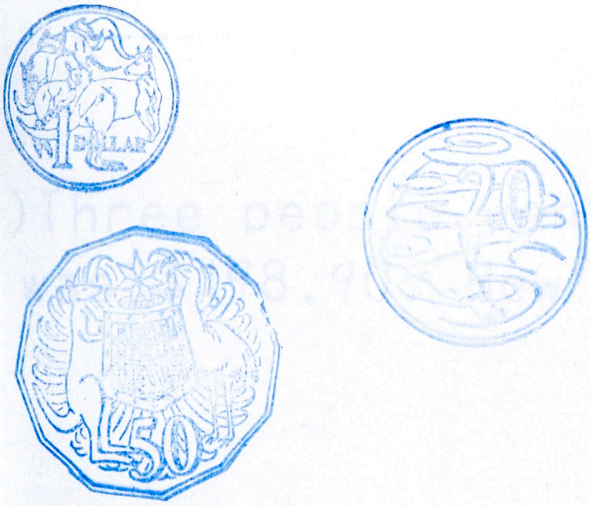


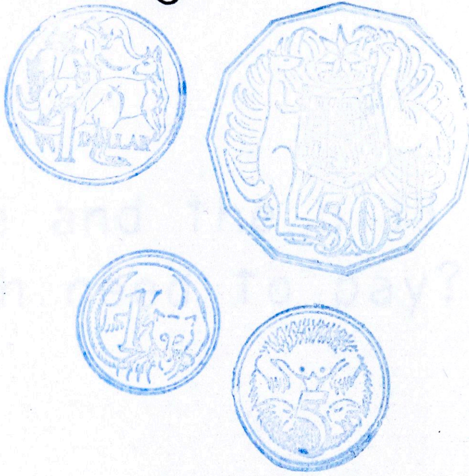


________ cents.

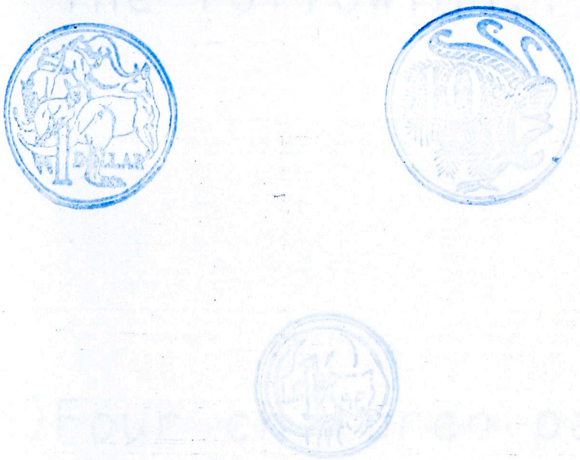
________ cents.

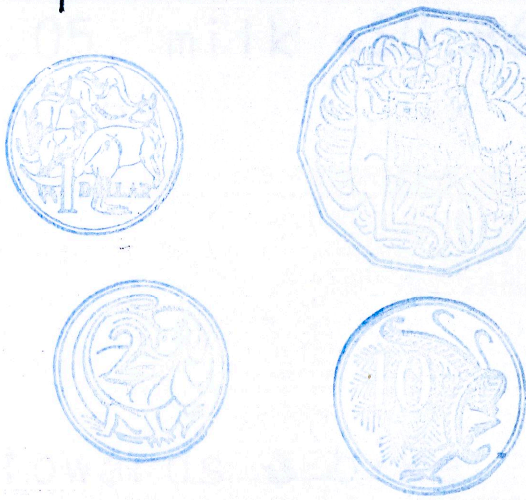
a. How much money all together?



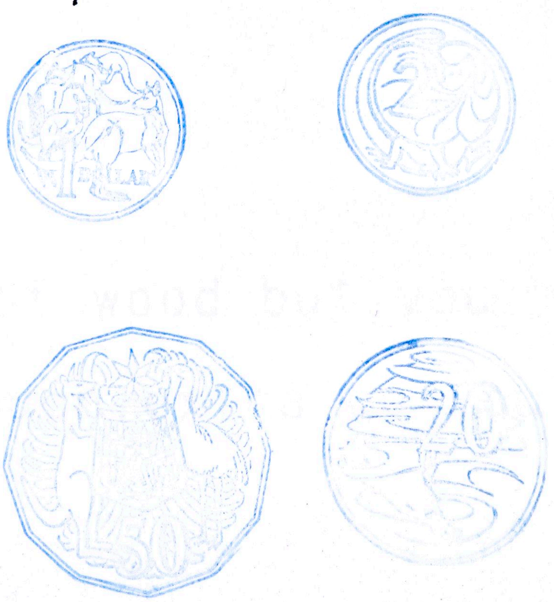


$ ______ $ ______





$ ______ $ ______



$ ______ $ ______

5. Using your calculator, solve these problems.

a) Three people went to the cafe and the bill was $198.90. How much did each need to pay?

b) What is the change from $10.00 if you spend the following.......tea =$1.05, milk =$0.86
beans =$2.64

c) Four children paid $25.99 towards a bike. How much was the total price?

d) You need a 4 metre lenght of wood but you only have 2.5 metres. How much extra do you need?

APPENDIX 5.3b. NUMBER TEST B.

PRACTICAL NUMBER TEST

1. Match the Unit with the Item

pocket money	metres
time	seconds
milk	dollars and cents
cost of lollies	litres
length	kilograms
a length of string	seconds
length of a movie	dollars and cents
weight	metres

2. Fill in the Following

If 1 metre = 100 centimetres

then 1 gram = ____________ centigrams

1 joule = ____________ centijoules

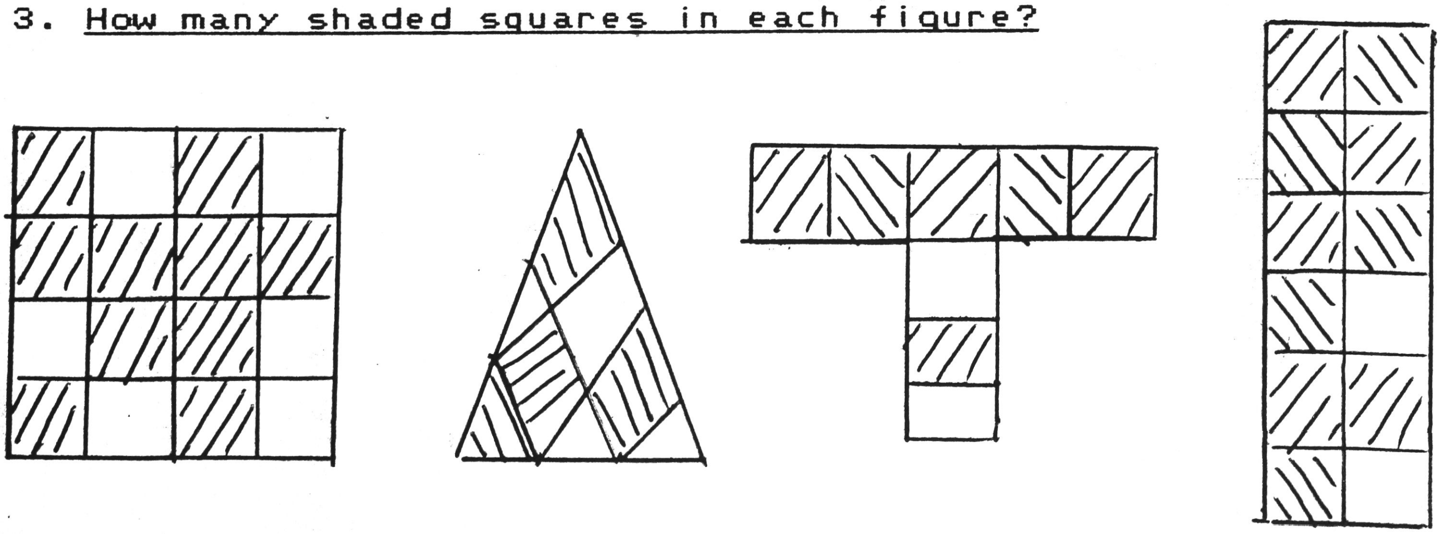
1 watt = ____________ centiwatts

If 1,000 metres = 1 kilometre

then 1,000 litres = ____________ kilolitres

1,000 grams = ____________ kilogram

3. How many shaded squares in each figure?



______________ ______________ ______________ ______________

4. <u>How many cents all together?</u>

_____________ cents

_____________ cents

_____________ cents

_____________ cents

_____________ cents

_____________ cents

4a. <u>How much money all together?</u>

$ ____________

$ ____________

$ ____________

$ ____________

$ ____________

$ ____________

5. <u>Using your calculator, solve these problems</u>

a) What is the change from $15.00 if you bought the following.........bread for $1.20, milk for $0.89 and butter for $2.50 ?

b) 12 Twelve men went for drinks and the bill was $156.36. How much did each need to pay?

c) You need 6 litres of milk, but you only have 3.5 litres. How much extra do you need ?

d) Five children each paid $26.98 towards a ring for their mother's birthday. How much was the ring ?

APPENDIX 6.

APPENDIX 6.

DOCUMENTATION: DEPARTMENT OF EDUCATION APPROVAL FOR RESEARCH IN STATE SCHOOLS.

1. Approval for Research in State Schools.
2. Request for extension of access (20.7.1987)
3. Departmental Confirmation that Principals have been notified of Departmental Approval.
4. Departmental Approval of Leave-Without-Pay for research testing.

New South Wales Government

Department of Education

35 Bridge Street, Sydney

Please address all communications to
N.S.W. Department of Education
Box 33, G.P.O., Sydney, N.S.W. 2001

Our reference: M1:KH:VT

Your reference:

Telephone: 2 0584 Ext. 8040 8201
Telegrams: "Schools Sydney"
Telex: 24420

Mrs Singh

Ms. J. Hall,
PO Box 7,
OAK FLATS. NSW. 2529.

Dear Ms. Hall,

I refer to your request to conduct research in Departmental schools concerning self instruction problem solving.

Approval has been given by the Director-General of Education, Mr. R. B. Winder, for you subject to certain conditions to approach the Principals of N.S.W. Departmental schools, nominated by you, seeking co-operation to participate in your study.

The certain conditions are:

- Your study does not include schools outside the South Coast Region.
- You should inform me whether you need to involve more than your class.
- The Research Applications Committee approves the use of your own class for the study and advises you that there is no need for you to send letters to parents requesting their consent.
- Should you need to use classes other than your own, please advise me when and by whom the SIPs model will be taught to participating teachers.
- Should you need to use classes other than your own, a copy of the letter to the principals of the schools involved should be forwarded to me. In the letter, you should state that you are seeking volunteer teachers who agree with the implementation of the SIPS model and that you seek the consent of the principal to use the model in the school.
- You are to correct the following errors in the number test: lenght, 1 kilometres, 1 metres, payed.

You are reminded that the participation of principals, teachers and students must be voluntary, and that this participation must be at the school's convenience.

When your study has been completed, you are asked to provide this Department with a report of your findings.

Yours sincerely,

B. Henry,
Leader,
Division of Management Information Services.

P.O. Box 7
OAK FLATS 2527
20.7.87

To: E. Henry,
Division of Management Information Services,
N.S.W. Department of Education,
Box 33,
G.P.O. SYDNEY 2001.

Dear Sir,

Thankyou for your letter advising me that approval has been given for my research in Departmental schools.

In accordance with your conditions, I am advising you that I need to involve more than my own class, and I will therefore need to approach the schools nominated in my Research Proposal (Oak Flats High School and Fairy Meadow Demonstration School), plus Kanahooka High School.

At present I am seeking a limited time (2 * 5 days) of study leave to enable me to personally pre-test, work with the participating teachers and post-test the pupils involved. Upon advise from the Department I will notify you by whom the SIPS model will be taught to the participating teachers, as noted in your conditions. Similarly, I will forward my letters to the Principals.

Thanking you,

Yours faithfully,

Mrs. Judith V. Hall (B.Ed., Grad. Dip. Ed. Stud (Spec. Ed.), Dip. Teach.

New South Wales Government

Department of Education

35 Bridge Street, Sydney

Please address all communications to N.S.W. Department of Education
Box 33, G.P.O., Sydney, N.S.W. 2001

Mrs. J. Hall,
PO Box 7,
OAK FLATS. NSW. 2527.

Our reference: M1:KH:VT

Your reference:

Telephone: 2 0584 Ext. 8040
Telegrams: "Schools Sydney"
Telex: 24420

Dear Mrs. Hall,

Thank you for the information in your letter dated 20th July, 1987. Principals of the schools you wish to approach will be advised of your approval to approach them.

Please forward to me a copy of the letter you intend to send to Principals.

Yours sincerely,

B Henry

B. Henry,
Leader,
Division of Management Information Services.

New South Wales Government

Department of Education
SOUTH COAST REGION

Office Level 1
Crown Central Tower
200 Crown Street, Wollongong
Box 1232, P.O. Wollongong, N.S.W. 2500

Mrs. J. V. Hall,
Albion Park Rail Public School.

Your reference:

Our reference: SC 7360444/2
For information contact: M. Goddard/DR
Telephone: (042) 290 880

11th September, 1987

Dear Mrs. Hall,

I refer to your application for study leave for the period 7th September to 11th September, 1987 and 30th November to 4th December, 1987.

As previously advised by phone your application for leave had been forwarded to the Assistant Director (Personnel) for consideration.

The Assistant Director (Personnel) has approved a grant of leave to you under the following terms:

1. 7th September to 11th September, 1987
   Study leave without pay;

2. 30th November to 4th December, 1987
   Leave without pay for personal reasons.

An adjustment on your vacation leave terms has been made in respect of the above leave.

Please find attached the relevant salary advice.

Yours faithfully,

M. R. Goddard
Senior Leave Clerk
~~for~~ Senior Administrative Officer

Form T.L.4 (Original)

SOUTH COAST

Please address all mail to:
Box 1232, Wollongong. 2500

Crown Central Building
Cnr. Crown & Keira Streets,
Wollongong. 2500
Telephone: 29 0888

DEPARTMENT OF EDUCATION

Serial No. C-N

RPL 7360444 HALL

Designation ASST.

J. V. HALL
ALBION PARK RAIL P.S.

Advice
SC 24734

Date: ~~7.8~~ 2.9.87

LEAVE OF ABSENCE has been granted to you on the undermentioned conditions. All dates shown are inclusive.

	PERIOD/S OF ABSENCE		* TYPE OF LEAVE	Non-Inc. Days		PERIOD/S OF ABSENCE		* TYPE OF LEAVE	Non-Inc. Days
	First Date	Last Date				First Date	Last Date		
1	7.9.87	11.9.87	STN ~~NPC~~		5	19.12.87	28.1.88	NPC	
2	26.9.87	3) 10.10.87	NPC		6	29.1.88	31.1.88	NPC	
3	i) 10.10.87	11.10.87	NPC		7				
4	30.11.87	4.12.87	NPC		8				

This form supersedes form(s) ....

RESUMED DUTY ON .... See notes below

This date has been notified for salary adjustment purposes.

Please retain this advice after having it initialled by the Principal.

*See Over

[signature]
for Secretary

Subjects taught ....

Year Level(s) ....

[signature]

NOTES:

(1) If further leave is required, application should be made before the above period expires and as soon as it is known it will be needed. Such application should be forwarded through the usual channel.

(2) Leave is debited against Long Service Leave to credit before Leave Without Pay is approved.

(3) A Resumption of Duty Notice (T.L. 21) should be submitted on the day of return to duty only after any absence of more than 3 days where:

(a) a leave application was submitted before resumption of duty, or

(b) a salary cheque has been withheld.

APPENDIX 7.

TABLE 1a. RATING IN BASIC PROBLEM SOLVING TECHNIQUES TEST RESULTS: RAW SCORES FOR PRE-TEST AND POST-TEST.

(Primary Experimental).

	NAME	RATING
Pre	Allison	3
Post		5
Diff		+2
Pre	Annette	4
Post		5
Diff		+1
Pre	Christine	1.5
Post		4
Diff		+2.5
Pre	Emily	1
Post		3.5
Diff		+2.5
Pre	Justin	3.5
Post		4.5
Diff		+1
Pre	Mark	4
Post		
Diff		
Pre	Melissa	1
Post		
Diff		
Pre	Paul	3
Post		5
Diff		+2
Pre	Robert	3
Post		5
Diff		+2
Pre	Ryan	1
Post		3
Diff		+2

Pre	Sherree	1
Post		3
Diff		+2
Pre	Sobi	2
Post		1
Diff		-1
Pre	Tony	4.5
Post		5
Diff		+0.5

TABLE 1b. RATING IN BASIC PROBLEM SOLVING TECHNIQUES TEST RESULTS: RAW SCORES FOR PRE-TEST AND POST-TEST.

(Primary Control).

	NAME	RATING
Pre	David	1
Post		2
Diff		+1
Pre	Desmond	1
Post		1
Diff		nil
Pre	James	1.5
Post		3
Diff		+1.5
Pre	Jenny	1.5
Post		1
Diff		-0.5
Pre	Mark	4.5
Post		3
Diff		-1.5
Pre	Nathan	2.5
Post		2.5
Diff		nil
Pre	Stephen	1
Post		3
Diff		+2

TABLE 1c. RATING IN BASIC PROBLEM SOLVING TECHNIQUES TEST RESULTS: RAW SCORES FOR PRE-TEST AND POST-TEST.

(Secondary Experimental).

	NAME	RATING
Pre	Bruno	2.5
Post		3.5
Diff		+1
Pre	Donald	3.5
Post		5
Diff		+1.5
Pre	Gary	1
Post		4
Diff		+3
Pre	Jamie	1
Post		3
Diff		+2
Pre	Jody	1
Post		4
Diff		+3
Pre	Kirsty	2
Post		2
Diff		nil
Pre	Lee	3.5
Post		3
Diff		-0.5
Pre	Raymond	2
Post		5
Diff		+3
Pre	Stephen	1.5
Post		3
Diff		+1.5

TABLE 1d. RATING IN BASIC PROBLEM SOLVING TECHNIQUES TEST RESULTS: RAW SCORES FOR PRE-TEST AND POST-TEST.

(Secondary Control).

	NAME	RATING
Pre	Darrell	3
Post		3
Diff		nil
Pre	David	3.5
Post		3
Diff		-0.5
Pre	Greg	3.5
Post		3.5
Diff		nil
Pre	Helen	1
Post		1
Diff		nil
Pre	Steve	2
Post		3
Diff		+1
Pre	Todd	1.5
Post		3
Diff		+1.5

TABLE 2a. READING RATE TEST RESULTS: READING AGE FOR PRE-TEST AND POST-TEST.

(Primary Experimental).

	NAME	READING AGE
Pre	Allison	10.10
Post		10.1
Diff		-9 months
Pre	Annette	7.7
Post		7.10
Diff		+3 months

Pre	Christine	T.L.A.
Post		T.L.A.
Diff		nil
Pre	Emily	T.L.A.[1]
Post		6.10
Diff		+6 months
Pre	Justin	6.8
Post		6.11
Diff		+3 months
Pre	Mark	7.2
Post		
Diff		
Pre	Melissa	T.L.A.
Post		
Diff		
Pre	Paul	T.L.A.
Post		6.11
Diff		+7 months
Pre	Robert	7.1
Post		7.11
Diff		+10 months
Pre	Ryan	T.L.A.
Post		T.L.A.
Diff		nil
Pre	Sherree	8.2
Post		9.5
Diff		+15 months
Pre	Sobi	T.L.A.
Post		6.7
Diff		+2 months
Pre	Tony	6.11
Post		7.1
Diff		+2 months

[1] Rate is calculated by Neale as a reading age from 6.6 and therefore difference for T.L.A and a score has been calculated from 6.4

TABLE 2b. READING RATE TEST RESULTS: READING AGE FOR PRE-TEST AND POST-TEST.

(Primary Control).

	NAME	READING AGE
Pre	David	8.5
Post		8.5
Diff		nil
Pre	Desmond	6.8
Post		7.8
Diff		+12 months
Pre	James	T.L.A.
Post		T.L.A.
Diff		nil
Pre	Jenny	7.8
Post		8.2
Diff		+6 months
Pre	Mark	8.0
Post		7.6
Diff		-6 months
Pre	Nathan	T.L.A.
Post		T.L.A.
Diff		nil
Pre	Stephen	6.9
Post		6.8
Diff		-1 month

TABLE 2c. READING RATE TEST RESULTS: READING AGE FOR PRE-TEST AND POST-TEST.

(Secondary Experimental).

	NAME	READING AGE
Pre	Bruno	8.7
Post		8.8
Diff		+1 month

Pre	Donald	8.2
Post		9.0
Diff		+10 months
Pre	Gary	T.L.A.
Post		7.3
Diff		+11 months
Pre	Jamie	7.7
Post		8.3
Diff		+8 months
Pre	Jody	T.L.A.
Post		6.6
Diff		+2 months
Pre	Kirsty	13+
Post		13+
Diff		nil
Pre	Lee	8.5
Post		11.4
Diff		+35 months
Pre	Raymond	6.8
Post		7.5
Diff		+9 months
Pre	Stephen	6.8
Post		6.8
Diff		nil

TABLE 2d. READING RATE TEST RESULTS: READING AGE FOR PRE-TEST AND POST-TEST.

(Secondary Control).

	NAME	READING AGE
Pre	Darrell	6.9
Post		6.11
Diff		+2 months
Pre	David	9.4
Post		9.3
Diff		-1 month
Pre	Greg	8.10

Post		9.1
Diff		+3 months
Pre	Helen	7.10
Post		9.11
Diff		+25 months
Pre	Steve	7.10
Post		7.8
Diff		-2 months
Pre	Todd	7.6
Post		8.3
Diff		+9 months

TABLE 3a. READING ACCURACY TEST RESULTS: READING AGE FOR PRE-TEST AND POST-TEST.

(Primary Experimental).

	NAME	READING AGE
Pre	Allison	8.10
Post		9.3
Diff		+5 months
Pre	Annette	8.4
Post		8.7
Diff		+3 months
Pre	Christine	T.L.A.
Post		T.L.A
Diff		nil
Pre	Emily	6.11
Post		7.2
Diff		+3 month
Pre	Justin	6.10
Post		7.2
Diff		+4 month
Pre	Mark	7.8
Post		
Diff		
Pre	Melissa	6.9

Post		
Diff		
Pre	Paul	6.6
Post		7.2
Diff		+8 month
Pre	Robert	7.10
Post		8.1
Diff		+3 month
Pre	Ryan	6.7
Post		6.10
Diff		+3 month
Pre	Sherree	7.7
Post		8.1
Diff		+6 months
Pre	Sobi	7.3
Post		7.7
Diff		+4 months
Pre	Tony	6.11
Post		7.8
Diff		+9 months

TABLE 3b. READING ACCURACY TEST RESULTS: READING AGE FOR PRE-TEST AND POST-TEST.

(Primary Control).

	NAME	READING AGE
Pre	David	8.6
Post		8.7
Diff		+1 month
Pre	Desmond	6.0
Post		6.10
Diff		+10 months
Pre	James	T.L.A.
Post		T.L.A.
Diff		nil

Pre	Jenny	6.10
Post		7.0
Diff		+2 months
Pre	Mark	6.9
Post		6.9
Diff		nil
Pre	Nathan	T.L.A.
Post		T.L.A.
Diff		nil
Pre	Stephen	6.10
Post		6.7
Diff		-3 months

TABLE 3c. READING ACCURACY TEST RESULTS: READING AGE FOR PRE-TEST AND POST-TEST.

(Secondary Experimental).

	NAME	READING AGE
Pre	Bruno	10.0
Post		9.8
Diff		-4 months
Pre	Donald	8.6
Post		8.10
Diff		+4 months
Pre	Gary	T.L.A.[2]
Post		6.10
Diff		+12 months
Pre	Jamie	6.11
Post		7.2
Diff		+3 months
Pre	Jody	6.7
Post		6.10
Diff		+3 months
Pre	Kirsty	8.6
Post		9.1
Diff		+7 months

Pre	Lee	7.5
Post		7.10
Diff		+5 months
Pre	Raymond	6.10
Post		7.2
Diff		+4 months
Pre	Stephen	6.8
Post		6.10
Diff		+2 months

[2]Accuracy is calculated by Neale as a reading age from 6.0 and therefore difference for T.L.A and a score has been calculated from 5.10

TABLE 3d. READING ACCURACY TEST RESULTS: READING AGE FOR PRE-TEST AND POST-TEST.

(Secondary Control).

	NAME	READING AGE
Pre	Darrell	6.7
Post		7.0
Diff		+5 months
Pre	David	9.3
Post		8.11
Diff		-4 months
Pre	Greg	7.9
Post		8.1
Diff		+4 months
Pre	Helen	7.3
Post		7.5
Diff		+2 months
Pre	Steve	7.0
Post		7.5
Diff		+5 months
Pre	Todd	7.4
Post		7.11
Diff		+7 months

TABLE 4a. READING COMPREHENSION TEST RESULTS: READING AGE FOR PRE-TEST AND POST-TEST.

(Primary Experimental).

	NAME	READING AGE
Pre	Allison	8.5
Post		8.11
Diff		+6 months
Pre	Annette	8.10
Post		8.10
Diff		nil
Pre	Christine	T.L.A.
Post		T.L.A.
Diff		nil
Pre	Emily	6.8
Post		7.4
Diff		+8 months
Pre	Justin	7.1
Post		8.2
Diff		+13 months
Pre	Mark	7.3
Post		
Diff		
Pre	Melissa	T.L.A.
Post		
Diff		
Pre	Paul	6.6
Post		8.2
Diff		+20 months
Pre	Robert	8.10
Post		8.2
Diff		-8 months
Pre	Ryan	6.6
Post		6.9
Diff		+3 months

Pre	Sherree	7.10
Post		8.2
Diff		+4 months
Pre	Sobi	7.3
Post		7.1
Diff		-2 months
Pre	Tony	8.2
Post		8.2
Diff		nil

TABLE 4b. READING COMPREHENSION TEST RESULTS: READING AGE FOR PRE-TEST AND POST-TEST.

(Primary Control).

	NAME	READING AGE
Pre	David	7.1
Post		8.2
Diff		+13 months
Pre	Desmond	6.8
Post		6.8
Diff		nil
Pre	James	T.L.A.
Post		T.L.A.
Diff		nil
Pre	Jenny	6.6
Post		6.8
Diff		+2 months
Pre	Mark	6.6
Post		6.8
Diff		+2 months
Pre	Nathan	T.L.A.
Post		T.L.A.
Diff		nil
Pre	Stephen	6.6
Post		6.6
Diff		nil

TABLE 4c. READING COMPREHENSION TEST RESULTS: READING AGE FOR PRE-TEST AND POST-TEST.

(Secondary Experimental).

	NAME	READING AGE
Pre	Bruno	6.11
Post		7.3
Diff		+4 months
Pre	Donald	8.5
Post		8.8
Diff		+3 months
Pre	Gary	T.L.A.[3]
Post		6.9
Diff		+8 months
Pre	Jamie	6.9
Post		6.8
Diff		-1 month
Pre	Jody	T.L.A.
Post		T.L.A.
Diff		nil
Pre	Kirsty	8.5
Post		8.11
Diff		+6 months
Pre	Lee	7.3
Post		7.4
Diff		+1 month
Pre	Raymond	6.11
Post		6.9
Diff		-2 months
Pre	Stephen	6.3
Post		6.3
Diff		nil

[3]Comprehension is calculated by Neale as a reading age from 6.3 and therefore difference for T.L.A and a score has been calculated from 6.1

TABLE 4d. READING COMPREHENSION TEST RESULTS: READING AGE FOR PRE-TEST AND POST-TEST.

(Secondary Control).

	NAME	READING AGE
Pre	Darrell	T.L.A.
Post		6.9
Diff		+8 months
Pre	David	10.1
Post		10.5
Diff		+4 months
Pre	Greg	8.5
Post		8.11
Diff		+6 months
Pre	Helen	7.6
Post		8.2
Diff		+8 months
Pre	Steve	6.11
Post		8.2
Diff		+15 months
Pre	Todd	7.10
Post		8.2
Diff		+4 months

TABLE 5a. AURAL COMPREHENSION TEST RESULTS: RAW SCORE AND % SCORE FOR PRE-TEST AND POST-TEST.

(Primary Experimental).

	NAME	RAW SCORE	% SCORE
Pre	Allison	1/16	6.25%
Post		4/16	25%
Diff			+18.75%
Pre	Annette	12/24	50%
Post		13/24	54.16%
Diff			+4.16%

Pre	Christine	9/20	45%
Post		13/20	65%
Diff			+20%
Pre	Emily	0/24	0%
Post		0/24	0%
Diff			nil
Pre	Justin	1/24	4.17%
Post		12/24	50%
Diff			+45.83%
Pre	Mark	6/24	25%
Post			
Diff			
Pre	Melissa	1/24	4.17%
Post			
Diff			
Pre	Paul	15/24	62.5%
Post		11/24	45.83%
Diff			-16.67%
Pre	Robert	4/24	16.67%
Post		10/24	41.67%
Diff			+25%
Pre	Ryan	4/24	16.67%
Post		12/24	50%
Diff			+33.33%
Pre	Sherree	0/24	0%
Post		6/24	25%
Diff			+25%
Pre	Sobi	0/24	0%
Post		2/24	8.33%
Diff			+8.33%
Pre	Tony	24/24	100%
Post		24/24	100%
Diff			nil

TABLE 5b. AURAL COMPREHENSION TEST RESULTS: RAW SCORE AND % SCORE FOR PRE-TEST AND POST-TEST.

(Primary Control).

	NAME	RAW SCORE	% SCORE
Pre	David	1/24	4.17%
Post		2/24	8.33%
Diff			+4.16%
Pre	Desmond	16/24	66.67%
Post		18/24	75%
Diff			+8.33%
Pre	James	6/20	30%
Post		14/20	70%
Diff			+40%
Pre	Jenny	5/24	20.83%
Post		5/24	20.83%
Diff			nil
Pre	Mark	7/24	29.17%
Post		16/24	66.66%
Diff			+37.50%
Pre	Nathan	9/20	45%
Post		5/20	25%
Diff			-20%
Pre	Stephen	5/24	20.83%
Post		9/24	37.50%
Diff			+16.67%

TABLE 5c. AURAL COMPREHENSION TEST RESULTS: RAW SCORE AND % SCORE FOR PRE-TEST AND POST-TEST.

(Secondary Experimental).

	NAME	RAW SCORE	% SCORE
Pre	Bruno	2/8	25%
Post		1/8	12.5%
Diff			-12.5%

Pre	Donald	6/24	25%
Post		10/24	41.67%
Diff			+16.67%
Pre	Gary	14/20	70%
Post		15/24	62.5%
Diff			-7.5%
Pre	Jamie	7/24	29.17%
Post		17/24	70.83%
Diff			+41.66%
Pre	Jody	1/24	4.17%
Post		4/24	16.67%
Diff			+12.5%
Pre	Kirsty	2/24	8.33%
Post		2/16	12.5%
Diff			+4.17%
Pre	Lee	2/24	8.33%
Post		5/24	20.83%
Diff			+12.5%
Pre	Raymond	15/24	62.5%
Post		13/24	54.17%
Diff			-8.33%
Pre	Stephen	1/24	4.17%
Post		4/24	16.67%
Diff			+12.5%

TABLE 5d. AURAL COMPREHENSION TEST RESULTS: RAW SCORE AND % SCORE FOR PRE-TEST AND POST-TEST.

(Secondary Control).

	NAME	RAW SCORE	% SCORE
Pre	Darrell	14/24	58.33%
Post		17/24	70.83%
Diff			+12.5%
Pre	David	5/8	62.5%
Post		8/16	50%
Diff			-12%
Pre	Greg	6/24	25%

Post		12/24	50%
Diff			+25%
Pre	Helen	12/24	50%
Post		2/24	8.33%
Diff			-41.66%
Pre	Steve	1/24	4.17%
Post		7/24	29.17%
Diff			+25%
Pre	Todd	19/24	79.17%
Post		11/24	45.83%
Diff			-33.33%

TABLE 6a. MATHEMATICS TEST RESULTS: RAW SCORES FOR PRE-TEST AND POST-TEST.

(Primary Experimental).

	NAME	Q.1	Q.2	Q.3	Q.4	Q.4a	Q.5
Pre	Allison	4/8	3/5	3/4	6/6	1/6	0/4
Post		6/8	3/5	3/4	5/6	3/6	0/4
Diff		+2	n	n	-1	+2	n
Pre	Annette	7/8	5/5	4/4	6/6	5/6	1/4
Post		7/8	0/5	4/4	5/6	5/6	4/4
Diff		n	-5	n	-1	n	+3
Pre	Christine	2/8	1/5	0/4	2/6	0/6	1/4
Post		3/8	5/5	4/4	3/6	1/6	0/4
Diff		+1	+4	+4	+1	+1	-1
Pre	Emily	3/8	1/5	4/4	6/6	6/6	0/4
Post		8/8	3/5	4/4	6/6	6/6	1/4
Diff		+5	+2	n	n	n	+1
Pre	Justin	0/8	5/5	4/4	6/6	6/6	0/4
Post		6/8	3/5	4/4	6/6	6/6	2/4
Diff		+6	-2	n	n	n	+2
Pre	Mark	1/8	0/5	4/4	6/6	3/6	0/4
Post							
Diff							
Pre	Melissa	2/8	0/5	1/4	1/6	0/6	0/4
Post							
Diff							
Pre	Paul	0/8	5/5	4/4	5/6	0/6	0/4
Post		3/8	3/5	4/4	4/6	3/6	0/4
Diff		+3	-2	n	-1	+3	n
Pre	Robert	4/8	3/5	4/4	5/6	2/6	0/4
Post		6/8	3/5	4/4	4/6	3/6	1/4
Diff		+2	n	n	-1	+1	+1
Pre	Ryan	0/8	1/5	0/4	0/6	0/6	0/4
Post		1/8	0/5	2/4	0/6	0/6	0/4
Diff		+1	-1	+2	n	n	n

Pre	Sherree	5/8	5/5	4/4	5/6	6/6	2/4
Post		6/8	3/5	4/4	5/6	5/6	3/4
Diff		+1	-2	n	n	-1	+1
Pre	Sobi	1/8	0/5	2/4	5/6	0/6	0/4
Post		4/8	1/5	1/4	5/6	0/6	0/6
Diff		+3	+1	-1	n	n	n
Pre	Tony	8/8	5/5	4/4	6/6	6/6	3/4
Post		8/8	3/5	4/4	6/6	6/6	3/4
Diff		n	-2	n	n	n	n

TABLE 6b. MATHEMATICS TEST RESULTS: RAW SCORES FOR PRE-TEST AND POST-TEST.

(Primary Control).

	NAME	Q.1	Q.2	Q.3	Q.4	Q.4a	Q.5
Pre	David	8/8	0/5	3/4	6/6	5/6	1/4
Post		6/8	0/5	0/4	6/6	6/6	1/4
Diff		-2	n	-3	n	+1	n
Pre	Desmond	7/8	5/5	4/4	6/6	6/6	0/4
Post		6/8	3/5	4/4	6/6	3/6	0/4
Diff		-1	-2	n	n	-3	n
Pre	James	3/8	0/5	0/4	0/6	0/6	0/4
Post		1/8	0/5	3/4	0/6	1/6	0/4
Diff		-2	n	+3	n	+1	n
Pre	Jenny	2/8	0/5	4/4	0/6	0/6	0/4
Post		1/8	2/5	4/4	0/6	0/6	0/4
Diff		-1	+2	n	n	n	n
Pre	Mark	6/8	2/5	4/4	3/6	0/6	0/4
Post		1/8	1/5	0/4	4/6	2/6	0/4
Diff		-5	-1	-4	+1	+2	n
Pre	Nathan	1/8	0/5	1/4	0/6	0/6	0/4
Post		1/8	0/5	4/4	0/6	1/6	0/4
Diff		n	n	+3	n	+1	n
Pre	Stephen	4/8	2/5	0/4	5/6	6/6	0/4
Post		6/8	0/5	4/4	6/6	4/6	0/4
Diff		+2	-2	+4	+1	-2	n

TABLE 6c. MATHEMATICS TEST RESULTS: RAW SCORES FOR PRE-TEST AND POST-TEST.

(Secondary Experimental).

	NAME	Q.1	Q.2	Q.3	Q.4	Q.4a	Q.5
Pre	Bruno	8/8	5/5	4/4	6/6	6/6	1/4
Post		8/8	0/5	4/4	6/6	6/6	0/4
Diff		n	-5	n	n	n	-1
Pre	Donald	8/8	0/5	4/4	6/6	6/6	2/4
Post		8/8	0/5	4/4	6/6	4/6	0/4
Diff		n	n	n	n	-2	-2
Pre	Gary	7/8	0/5	4/4	6/6	5/6	2/4
Post		3/8	1/5	4/4	6/6	4/6	0/4
Diff		-4	+1	n	n	-1	-2
Pre	Jamie	7/8	3/5	4/4	6/6	6/6	1/4
Post		8/8	5 5	4/4	6/6	4/4	0/4
Diff		+1	+5	n	n	-2	-1
Pre	Jody	6/8	0/5	1/4	3/6	0/6	0/4
Post		1/8	3/5	4/4	0/6	0/6	0/4
Diff		-5	+3	+3	-3	n	n
Pre	Kirsty	6/8	0/5	4/4	6/6	0/6	0/4
Post		6/8	1/5	2/4	5/6	2/6	0/4
Diff		n	+1	-2	-1	+2	n
Pre	Lee	6/8	0/5	1/4	6/6	6/6	2/4
Post		6/8	5/5	4/4	6/6	6/6	2/4
Diff		n	+5	+3	n	n	n
Pre	Raymond	8/8	0/5	4/4	6/6	6/6	2/4
Post		8/8	5/5	4/4	6/6	4/6	1/4
Diff		n	+5	n	n	-2	-1
Pre	Stephen	5/8	0/5	4/4	5/6	0/6	0/4
Post		8/8	0/5	4/4	6/6	4/6	0/4
Diff		+3	n	n	+1	+4	n

TABLE 6d. MATHEMATICS TEST RESULTS: RAW SCORES FOR PRE-TEST AND POST-TEST.

(Secondary Control).

	NAME	Q.1	Q.2	Q.3	Q.4	Q.4a	Q.5
Pre	Darrell	4/8	3/5	2/4	6/6	6/6	2/4
Post		3/8	5/5	4/4	6/6	6/6	3/4
Diff		-1	+2	+2	n	n	+1
Pre	David	8/8	5/5	4/4	0/6	6/6	2/4
Post		8/8	3/5	3/4	4/6	4/6	0/4
Diff		n	-2	-1	+4	-2	-2
Pre	Greg	7/8	5/5	3/4	5/6	4/6	3/4
Post		6/8	1/5	4/4	6/6	6/6	1/4
Diff		-1	-4	+1	+1	+2	-2
Pre	Helen	7/8	5/5	4/4	6/6	6/6	2/4
Post		8/8	5/5	4/4	5/6	6/6	2/4
Diff		+1	n	n	-1	n	n
Pre	Steve	8/8	3/5	0/4	6/6	6/6	2/4
Post		0/8	5/5	2/4	6/6	6/6	1/4
Diff		-8	+2	+2	n	n	-1
Pre	Todd	8/8	3/5	2/4	6/6	6/6	3/4
Post		8/8	5/5	4/4	6/6	6/6	2/4
Diff		n	+2	+2	n	n	-1

TABLE 7a. DIFFERENCES OBTAINED IN EACH TEST

(Primary Experimental).

NAME	T.1	T.2	T.3	T.4	T.5	T.6q1	q2	q3	q4	q4a	q5
	(raw)	(months)			(%)	(raw)					
Allison	+2	-9	+5	+6	+18.75	+2	n	n	-1	+2	n
Annette	+1	+3	+3	n	+4.16	n	-5	n	-1	n	+3
Christine	+2.5	n	n	n	+20.	+1	+4	+4	+1	+1	-1
Emily	+2.5	+6	+3	+8	n	+5	+2	n	n	n	+1
Justin	+1	+3	+4	+13	+45.83	+6	-2	n	n	n	+2
Paul	+2	+7	+8	+20	-16.67	+3	+2	n	-1	+3	n
Robert	+2	+10	+3	-8	+25	+2	n	n	-1	+1	+1
Ryan	+2	n	+3	+3	+33.33	+1	-1	+2	n	n	n
Sherree	+2	+15	+6	+4	+25	+1	-2	n	n	-1	+1
Sobi	-1	+7	+4	-2	+8.33	+3	+1	-1	n	n	n
Tony	+0.5	+2	+9	n	n	n	-2	n	n	n	n

TABLE 7b. DIFFERENCES OBTAINED IN EACH TEST

(Primary Control).

NAME	T.1	T.2	T.3	T.4	T.5	T.6q1	q2	q3	q4	q4a	q5
	(raw)	(months)			(%)	(raw)					
David	+1	n	+1	+13	+4.16	-2	n	-3	n	+1	n
Desmond	n	+12	+10	n	+18.33	-1	-2	n	n	-3	n
James	+1.5	n	n	n	+40.0	-2	n	+3	n	+1	n
Jenny	-0.5	+6	+2	+2	n	-1	+2	n	n	n	n
Mark	-1.5	-6	n	+2	+37.5	-5	-1	-4	+1	+2	n
Nathan	n	n	n	n	-20.0	n	n	+3	n	+1	n
Stephen	+2	-1	-3	n	+16.67	+2	-2	+4	+1	-2	n

TABLE 7c. DIFFERENCES OBTAINED IN EACH TEST

(Secondary Experimental).

NAME	T.1	T.2	T.3	T.4	T.5	T.6q1	q2	q3	q4	q4a	q5
	(raw)	(months)			(%)		(raw)				
Bruno	+1	+1	-4	+4	-12.5	n	-5	n	n	n	-1
Donald	+1.5	+10	+4	+3	+16.67	n	n	n	n	-2	-2
Gary	+3	+11	+12	+8	-7.5	-4	+1	n	n	-1	-2
Jamie	+2	+8	+3	-1	+41.66	+1	+5	n	n	-2	-1
Jodie	+3	+2	+3	n	+12.5	-5	+3	+3	-3	n	n
Kirsty	n	n	+7	+6	+4.17	n	+1	-2	-1	+2	n
Lee	-0.5	+35	+5	+1	+12.5	n	+5	+3	n	n	n
Raymond	+3	+9	+4	-2	-8.33	n	+5	n	n	-2	-1
Stephen	+1.5	n	+2	n	+12.5	+3	n	n	+1	+4	n

TABLE 7d. DIFFERENCES OBTAINED IN EACH TEST

(Secondary Control).

NAME	T.1	T.2	T.3	T.4	T.5	T.6q1	q2	q3	q4	q4a	q5
	(raw)	(months)			(%)		(raw)				
Darrell	n	+2	+5	+8	+12.5	-1	+2	+2	n	n	+1
David	-5	-1	-4	+4	-12	n	-2	-1	+4	-2	-2
Greg	n	+3	+4	+6	+25.0	-1	-4	+1	+1	+2	-2
Helen	n	+25	+2	+8	-41.66	+1	n	n	-1	n	n
Stev	+1	-2	+5	+15	+25	-8	+2	+2	n	n	-1
Todd	+1.5	+9	+7	4	-33.33	n	+2	+2	n	n	-1

APPENDIX 8.

Table 8a. Analysis of Variance

General Problem Solving Technique.

Primary

SIPSY By School with SIPSX

Source of Variation	Sum of Squares	DF	Mean Square	F	Signf of F
Covariates	12.557	1	12.557	13.307	.002
SIPSX	12.007	1	12.557	13.307	.002
Main Effects	8.358	1	8.358	8.857	.009
Sch	8.358	1	8.358	8.857	.009
Explained	20.915	2	10.457	11.082	.001
Residual	14.155	15	.944		
TOTAL	35.069	17	2.063		

33 cases were processed

15 (45.5 PCT) were missing.

Table 8b. Analysis of Variance

General Problem Solving Technique.

Secondary

SIPSY By School with SIPSX

Source of Variation	Sum of Squares	DF	Mean Square	F	Signf of F
Covariates	.775	1	.775	.912	.359
SIPSX	.775	1	.775	.912	.359
Main Effects	3.455	1	3.455	4.063	.067
Sch	3.455	1	3.455	4.063	.067
Explained	4.230	2	2.115	2.487	.125
Residual	10.203	12	.850		
TOTAL	14.433	14	1.031		

33 cases were processed

18 (54.5 PCT) were missing.

Table 8c. Analysis of Variance

Reading Rate.

Primary

RRY By School with RRX

Source of Variation	Sum of Squares	DF	Mean Square	F	Signf of F
Covariates	16.904	1	16.904	61.243	.000
RRX	16.904	1	16.904	61.243	.000
Main Effects	.286	1	.286	1.037	.325
Sch	.286	1	.286	1.037	.325
Explained	17.191	2	8.595	31.140	.000
Residual	4.140	15	.276		
TOTAL	21.331	17	1.255		

33 cases were processed

15 (45.5 PCT) were missing.

Table 8d. Analysis of Variance

Reading Rate.

Secondary

RRY By School with RRX

Source of Variation	Sum of Squares	DF	Mean Square	F	Signf of F
Covariates	34.533	1	34.533	41.533	.000
RRX	34.533	1	34.533	41.533	.000
Main Effects	.142	1	.142	.171	.687
Sch	.142	1	.142	.171	.687
Explained	34.675	2	17.338	20.852	.000
Residual	9.978	12	.831		
TOTAL	44.653	14	3.190		

33 cases were processed

18 (54.5 PCT) were missing.

Table 8e. Analysis of Variance

Reading Accuracy

Primary

RAY By School with RAX

Source of Variation	Sum of Squares	DF	Mean Square	F	Signf of F
Covariates	14.993	1	14.993	197.928	.000
RAX	14.993	1	14.993	197.928	.000
Main Effects	.249	1	.249	3.290	.090
Sch	.249	1	.249	3.290	.090
Explained	15.242	2	7.621	100.609	.000
Residual	1.136	15	.076		
TOTAL	16.378	17	.963		

33 cases were processed

15 (45.5 PCT) were missing.

Table 8f. Analysis of Variance

Reading Accuracy

Secondary

RAY By School with RAX

Source of Variation	Sum of Squares	DF	Mean Square	F	Signf of F
Covariates	7.683	1	7.683	21.605	.001
RAX	7.683	1	7.683	21.605	.001
Main Effec					
ts	.139	1	.139	.391	.543
Sch	.139	1	.139	.391	.543
Explained	7.822	2	3.911	10.998	.002
Residual	4.267	12	.356		
TOTAL	12.090	14	.864		

33 cases were processed

18 (54.5 PCT) were missing.

Table 8g. Analysis of Variance

Reading Comprehension

Primary

RCY By School with RCX

Source of Variation	Sum of Squares	DF	Mean Square	F	Signf of F
Covariates	11.202	1	11.202	37.567	.000
RCX	11.202	1	11.202	37.567	.000
Main Effects	.388	1	.388	1.301	.272
Sch	.388	1	.388	1.301	.272
Explained	11.590	2	5.795	19.434	.000
Residual	4.473	15	.298		
TOTAL	16.063	17	.945		

33 cases were processed

15 (45.5 PCT) were missing.

Table 8h. Analysis of Variance

Reading Comprehension

Secondary

RCY By School with RCX

Source of Variation	Sum of Squares	DF	Mean Square	F	Signf of F
Covariates	18.873	1	18.873	196.213	.000
RCX	18.873	1	18.873	196.213	.000
Main Effects	.783	1	.783	8.143	.015
Sch	.783	1	.783	8.143	.015
Explained	19.656	2	9.828	102.178	.000
Residual	1.154	12	.096		
TOTAL	20.810	14	1.486		

33 cases were processed

18 (54.5 PCT) were missing.

Table 8i. Analysis of Variance

Aural Comprehension

Primary

ACY By School with ACX

Source of Variation	Sum of Squares	DF	Mean Square	F	Signf of F
Covariates	409.326	1	409.326	21.726	.000
ACX	409.326	1	409.326	21.726	.000
Main Effects	.595	1	.595	.032	.861
Sch	.595	1	.595	.032	.861
Explained	409.921	2	204.961	10.879	.001
Residual	282.603	15	18.840		
TOTAL	692.524	17	40.737		

33 cases were processed

15 (45.5 PCT) were missing.

Table 8j. Analysis of Variance

Aural Comprehension

Secondary

ACY By School with ACX

Source of Variation	Sum of Squares	DF	Mean Square	F	Signf of F
Covariates	138.992	1	138.992	6.561	.025
ACX	138.992	1	138.992	6.561	.025
Main Effects	.793	1	.793	.037	.850
Sch	.793	1	.793	.037	.850
Explained	139.784	2	69.892	3.299	.072
Residual	254.216	12	21.185		
TOTAL	394.000	14	28.143		

33 cases were processed

18 (54.5 PCT) were missing.

Table 8k. Analysis of Variance

Basic Mathematics

Primary

MY By School with MX

Source of Variation	Sum of Squares	DF	Mean Square	F	Signf of F
Covariates	999.765	1	999.765	86.151	.000
MX	999.765	1	999.765	86.151	.000
Main Effects	101.775	1	101.775	8.770	.010
Sch	101.775	1	101.775	8.770	.010
Explained	1101.540	2	550.770	47.461	.000
Residual	174.071	15	11.605		
TOTAL	1275.611	17	75.036		

33 cases were processed

15 (45.5 PCT) were missing.

Table 8l. Analysis of Variance

Basic Mathematics

Secondary

MY By School with MX

Source of Variation	Sum of Squares	DF	Mean Square	F	Signf of F
Covariates	261.018	1	261.018	12.242	.004
MX	261.018	1	261.018	12.242	.004
Main Effects	1.533	1	1.533	.072	.793
Sch	1.533	1	1.533	.072	.793
Explained	262.551	2	131.275	6.157	.014
Residual	255.849	12	21.321		
TOTAL	518.400	14	37.029		

33 cases were processed

18 (54.5 PCT) were missing.

Table 8m. Analysis of Variance

Basic Problem Solving Technique

Primary versus Secondary for Experimental Groups

SIPSY By School with SIPSX

Source of Variation	Sum of Squares	DF	Mean Square	F	Signf of F
Covariates	6.658	1	6.658	6.155	.024
SIPSX	6.658	1	6.658	6.155	.024
Main Effects	.091	1	.091	.084	.776
Sch	.091	1	.091	.084	.776
Explained	6.749	2	3.374	3.119	.070
Residual	18.389	17	1.082		
TOTAL	25.137	19	1.323		

33 cases were processed

13 (39.4 PCT) were missing.

Table 8n. Analysis of Variance

Reading Rate

Primary versus Secondary for Experimental Groups

RRY By School with RRX

Source of Variation	Sum of Squares	DF	Mean Square	F	Signf of F
Covariates	51.153	1	51.153	98.039	.000
RRX	51.153	1	51.153	98.039	.000
Main Effects	1.010	1	1.010	1.936	.182
Sch	1.010	1	1.010	1.936	.182
Explained	52.163	2	26.082	49.988	.000
Residual	8.870	17	.522		
TOTAL	61.033	19	3.212		

33 cases were processed

13 (39.4 PCT) were missing.

Table 8o. Analysis of Variance

Reading Accuracy

Primary versus Secondary for Experimental Groups

RAY By School with RAX

Source of Variation	Sum of Squares	DF	Mean Square	F	Signf of F
Covariates	13.102	1	13.102	42.916	.000
RAX	13.102	1	13.102	42.916	.000
Main Effects	.191	1	.191	.624	.440
Sch	.191	1	.191	.624	.440
Explained	13.293	2	6.646	21.770	.000
Residual	5.190	17	.305		
TOTAL	18.483	19	.973		

33 cases were processed

13 (39.4 PCT) were missing.

Table 8p. Analysis of Variance

Reading Comprehension

Primary versus Secondary for Experimental Groups

RCY By School with RCX

Source of Variation	Sum of Squares	DF	Mean Square	F	Signf of F
Covariates	13.130	1	13.130	52.038	.000
RCX	13.130	1	13.130	52.038	.000
Main Effects	.252	1	.252	.998	.332
Sch	.252	1	.252	.998	.332
Explained	13.381	2	6.691	26.518	.000
Residual	4.289	17	.252		
TOTAL	17.670	19	.930		

33 cases were processed

13 (39.4 PCT) were missing.

Table 8q. Analysis of Variance

Aural Comprehension

Primary versus Secondary for Experimental Groups

ACY By School with ACX

Source of Variation	Sum of Squares	DF	Mean Square	F	Signf of F
Covariates	460.521	1	460.521	33.522	.000
ACX	460.521	1	460.521	33.522	.000
Main Effects	14.928	1	14.928	1.087	.312
Sch	14.928	1	14.928	1.087	.312
Explained	475.449	2	237.724	17.304	.000
Residual	233.543	17	13.738		
TOTAL	708.992	19	37.315		

33 cases were processed

13 (39.4 PCT) were missing.

Table 8r. Analysis of Variance

Basic Mathematics

Primary versus Secondary for Experimental Groups

MY By School with MX

Source of Variation	Sum of Squares	DF	Mean Square	F	Signf of F
Covariates	718.342	1	718.342	40.546	.000
MX	718.342	1	718.342	40.546	.000
Main Effects	16.277	1	16.277	.919	.351
Sch	16.277	1	16.277	.919	.351
Explained	734.618	2	367.309	20.733	.000
Residual	301.181	17	17.717		
TOTAL	1035.800	19	54.516		

33 cases were processed

13 (39.4 PCT) were missing.

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